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HYDERABAD ELECTRIC SUPPLY COMPANY (HESCO) OPERATIONAL AUDIT REPORT

Produced by:

MWP-USAID POWER DISTRIBUTION IMPROVEMENT PROGRAM

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CONTENTS

ACRONYMS

ABC - Aerial Bundled Conductor

ACR – Annual Confidential Report

ADB – Asian Development Bank

AEB – Area Electricity Board (former name for DISCO)

AMR – Automated Meter Reading

BFP – Book of Financial Powers

BOD - Board of Directors

BPS - Basic Pay Scale

CDWP - Central Development Working Party

CE – Chief Engineer

CEO – Chief Executive Officer

CFO – Chief Financial Officer

CIS – Customer Information System

COBOL - Common Business-Oriented Language

CP – Commercial Procedure

CPPA -- Central Power Purchasing Agency

CSO – Customer Services Officer

CSR - Corporate Social Responsibility

CT – Current Transformer

CTC – Circle Training Center

CWIP – Construction Work in Progress

D&S – Design & Standards

DISCO – Distribution Company

DISCOs – Distribution Companies

DOP – Distribution of Power

DP – Distribution Planning

ECNEC - Executive Committee of National Economic Council

ELR – Energy Loss Reduction

ERO - Equipment Removal Order

ERP – Enterprise Resource Planning

FDRANA – Feeder Analysis (Software)

FESCO – Faisalabad Electric Supply Company Limited

GENCO – Generation Company

GEPCO – Gujranwala Electric Power Company Limited

GIS – Geographic Information System

GOP – Government of Pakistan

GST – General Sales Tax

GWh – Gigawatt hour

HESCO - Hyderabad Electric Supply Company Limited

HQ – Headquarter

HR – Human Resource

HT – High tension(11kV)

IA – Internal Audit

ICT – Information Communication Technology

IESCO – Islamabad Electric Supply Company Limited

IPP – Independent Power Producer

IT – Information Technology

KALAMZU book – Meter Reading book

Km – Kilometer

KPIs – Key Performance Indicators

kV – Kilovolt

kVA – Kilovolt Ampere

kVAR – Kilovolt Ampere Reactive

kVAR – Kilovolt Ampere Reactive Hours

kW – Kilowatt

kWh – Kilowatt hour

LDC – Lower Division Clerk

LESCO - Lahore Electric Supply Company Limited

LPF – Low Power Factor

LS – Line Superintendent

LT – Low tension, (0.4 kV)

M&T - Metering and Testing

MDI - Maximum Demand Indicator

MEPCO – Multan Electric Power Company Limited

MIS – Management Information System

MVAR - Megavolt Ampere Reactive

MW – Megawatt

MWh – Megawatt hour

MWP – Ministry of Water and Power

NADRA – National Database and Registration Authority

NEPRA – National Electric Power Regulatory Authority

NRECA - National Rural Electric Cooperative Association, USA

NTDC – National Transmission and Dispatch Company Limited

PC - Planning Commission

PDIP – Power Distribution Improvement Program

PEL – Pak Elektron Ltd.

PEPCO - Pakistan Electric Power Company Limited

PER - Performance Evaluation Report

PESCO – Peshawar Electric Supply Company Limited

PPRA – Public Procurement Regulatory Authority

PR – Public Relation

PRO – Public Relation Officer

PTCL – Pakistan Telecommunication Corporation

QESCO – Quetta Electric Supply Company Limited

REA - Rural Electrification Administration, USA

RORB – Return On Regulatory Asset Base

RTC - Regional Training Center

SBP – State Bank of Pakistan

SCO - Service Connection Order

SDO – Sub Divisional Officer

SE – Superintending Engineer

USAID – United States Agency for International Development

USC – Use of System Charges

WACC - Weighted Average Cost of Capital

WAPDA – Water and Power Development Authority

XEN – Executive Engineer

EXECUTIVE SUMMARY

OVERVIEW OF THE PROJECT

Background

Pakistan's Power Sector is, and has been for many years, beset by significant challenges. These include limited availability of reliable and affordable electric power, aging and inadequate transmission and distribution networks, and utility policies and practices that badly lag behind those of modern utilities elsewhere in the world. Moreover, a current-day, technology infrastructure that can enable efficient, back-office operations, such as handling customer service requests, is not in evidence.

For a major electric distribution utility like Hyderabad Electric Supply Company (HESCO), these deficiencies translate into a level of financial performance that cannot be considered self-sustaining. And financial self-sufficiency is becoming critical. Pakistan's power industry is undergoing sweeping changes, transitioning from wholly Government-owned utilities to fully autonomous companies that will engage in power generation, transmission, and distribution under the Government's aggressive reform agenda. A similar industry structure exists and functions smoothly in many other countries today. In Pakistan's case however, badly outdated policies, procedures and work practices, as well as chronically low levels of investment in utility infrastructure, pose serious barriers to a successful transition.

In July, 2010, three circles of HESCO were administratively separated and a new distribution company namely SEPCO (Sukkur Electric Supply Company has been created but to date SEPCO has neither been issued a license by NEPRA nor enabling corporate environment has been created. For the purpose of operational audit PDIP considered SEPCO as an integral part of HESCO since the legal and regulatory requirements for creation of SEPCO have yet to be formalized.

Purpose

The Power Distribution Improvement Program (PDIP) is a three-year, USAID-financed project designed to facilitate improvements in electric power distribution utilities across Pakistan. The project began in September, 2010. PDIP was designed to be implemented in two distinct phases:

- **Component 1** consists of performing operational audits of each of the eight Government-owned distribution utilities (DISCOs). The purpose of these in-depth, operational audits was to establish baseline information that can be used to measure improvement in performance over time. Audits covered governance, operational, financial, human resources, communications and customer service areas and surfaced opportunities for fundamental improvement in all areas. These improvement opportunities are reflected in specific Performance Improvement Action Plans that are also being completed as part of Component 1.

- **Component 2** will focus on implementation of the proposed Performance Improvement Action Plans submitted jointly by PDIP and each DISCO, including implementation of demonstration projects to illustrate the value of a number of key operational improvements and directly measure their value to the utility.

- HESCO has adequate investment through ADB Power Distribution Enhancement Investment Program (Tranche I & II) and World Bank Electricity Distribution & Transmission Improvement Project with major emphasis on transmission system expansion, up-gradation and augmentation. Therefore, PDIP focus is mainly on distribution system (11kV and below) improvement as it lacked investment.

MAJOR FINDINGS & CONCLUSIONS

The operational audit conducted for HESCO during Component 1 provided extensive insights into how HESCO operates and the performance consequences of the company's current approaches and practices. The PDIP team also became acutely aware of deficiencies that obstruct progress toward improvement. Part of the challenge faced by HESCO's management and board in seeking to 'bootstrap' overall performance, enhance customer service and create greater financial self-sufficiency will be to select the *right* actions at all levels, from front-line operations to strategic planning and assign the *right* priorities. This summary of major findings culled from the operational audit findings contained throughout this report is intended to provide a starting point for management consideration.

Table 1 below highlights major findings and conclusions of Component 1 of this project. Additional, detailed findings can be found in Section 2 of this report.

GOVERNANCE	HESCO's governance system has not yet made the transition to a business-like electric utility focus. HESCO remains subject to political intervention, and the Board of Directors was disbanded by the MWP in November, 2010 and has been recently reconstituted by the Government. The new Board members represent a better mix of professionals and stakeholders. However, more fundamental changes will be required to enable the Board to exert the strategic influence the company will need to succeed in the restructured Pakistani power sector and to improve the company's operating and financial performance to more acceptable levels.
ORGANIZATION	HESCO's current organization is not structured along functional lines as seen in most modern electric distribution utilities worldwide but primarily by geographic areas. Commercial functions responsible for cash flows within the utility should not report to Superintending Engineers whose responsibilities focus on power system stability and reliability. The current arrangement also creates potential conflicts of interest in the performance of key jobs within the utility.
ENGINEERING	Planning is a serious deficiency in HESCO, especially for the village electrification program, which in 2010 constituted the majority of HESCO's investments. Preliminary loss analysis on four (4) sample feeders using GIS mapping & modeling technique with a load flow software shows that technical loss for HESCO's distribution system is approximately 9%, as compared to non-technical loss of 22.2%. Work practices and construction standards of HESCO are a threat to both employees and public safety, as evidenced by the 49 fatalities, including 11 linemen, attributed to HESCO facilities in 2010.
FINANCIAL	HESCO's current ratio indicates it may have trouble paying its current debts timely. The operational efficiency ratio of consumers per employee is the second lowest of all DISCOs. Amounts due from Sindh government are more than Rs. 25.7 billion. The HESCO collection rate for government clients is much lower than it is for private clients; the collection rate for government clients is 18.2%. Enterprise systems offer the opportunity to convert manual business and distribution operating systems to electronic, computerized management systems. This will be important as HESCO transitions into customer information and billing system, geographical information systems (GIS) and applications. HESCO's cash flows are impacted by the lack of electronic funds transfer capability on the part of a significant number of organizations operating customer pay points. This situation works against the timely receipt of funds necessary to operate the business. The company also shoulders certain cost burdens that are rarely, if ever, seen among leading utilities worldwide. As a result, investment in both distribution system assets and employee equipment is hampered by low capital availability and operating performance impacted by poor cash flows. A new, rationalized financial framework—covering both internal and external relationships and transactions—is needed to assure better bottom-line performance.
COMMERCIAL	The lack of discipline in following the prescribed commercial procedures has lead to higher than necessary levels of payment arrearages, and low customer satisfaction. Inadequate monitoring of meter reading has resulted in inaccurate billing. The lack of support from civil authorities has made

	disconnection procedures ineffective; consequently recoveries have declined to 46% of assessments while receivables have increased 54% over the previous year. Shortages of meters and equipments result in long lead times to establish new connections resulting in many unauthorized connections. HESCO has not made any substantial updates to its commercial procedures since the late 1980s. The increased number of customers and the large geographic area has made it difficult to maintain the manual and fragmented processes. The inefficiencies of the manual systems result in billing delays, data manipulation and a loss of revenues.
HUMAN RESOURCES	HESCO's corporate culture is akin to that of a government agency in which lifetime employment without performance expectations is balanced by low salaries. This environment makes it difficult for HESCO to recruit skilled candidates for open positions because the best candidates demand higher salaries in private industry. As a consequence, HESCO is both overstaffed by any reasonable benchmark, and under-resourced, with serious shortages of employees with the right mix of technical training, experience and motivation to accomplish its mission. Moreover, the corporate culture requires a complete overhaul to instill in all employees the strategic message that quality of work, professional dedication & integrity, loyalty to the company, responsiveness to customer service, and constant attention to safety are among the company's core values.
COMMUNICATIONS & OUTREACH	HESCO stands at a turning point where it has yet to realize the significance of communications and outreach. The organizational culture follows outdated practices of public sector communication, resisting the process of transition to a corporate, service delivery organization. The Public Relations (PR) department has a marginalized role without access to resources, facilities and authority to undertake pro-active communications, public outreach and corporate image building. Hence, the consumer outreach is restricted to sporadic, often need-based and fragmented activities. The electronic communications culture is a distant reality as the use of computers is understood as replacement of typewriters. The web presence is static, unfriendly and not interactive. The customer complaints are served through a substitute staff from the field. HESCO needs to revamp its internal communications as well as rules of engagement with stakeholders. The state of electricity theft is rampant in HESCO's service territory creating a dire need for a consumer behavioral change communication to ensure a more responsible, accountable and vigilant consumption pattern amongst the electricity consumers of HESCO.

KEY RECOMMENDATIONS

Table 2 contains key recommendations of Component 1. Additional, detailed recommendations can be found in Section 3 of this report.

GOVERNANCE	The recently reconstituted Board of Directors should be given authority to direct the affairs of HESCO. The Board should be empowered to: 1. Set company policies, performance objectives and strategic directions. 2. Adopt bylaws. 3. Name members to its advisory, executive, finance, and other

	committees. 4. Hire, monitor, evaluate, and fire the CEO and senior executives.
ORGANIZATION	An evaluation of organizational changes required to improve HESCO's technical, commercial and overall operational performance should be made. Organizing HESCO along functional lines, establishing lines of authority and responsibility through departments including General and Administration, Commercial Management, Finance, Operations and Maintenance, and Engineering and Planning should be considered. Limiting the number of direct reports to the CEO will allow him to focus on strategic issues, leaving day-to-day operational management to qualified senior managers.
ENGINEERING	The operational audit produced a large number of specific recommendations in the areas of loss reduction, mapping and planning, high tension, low tension, and metering. These are detailed in the Recommendations section of this report. One key recommendation which holds the promise to improve many areas of engineering performance is to develop a GIS for the entire HESCO service territory; to link the GIS with engineering software in order to develop long-term system planning capability. This would allow HESCO to perform detailed short- and long-range work plans, identifying loss reduction targets and to expand service capacity where and when necessary.
FINANCIAL	HESCO's greatest financial vulnerability centers on its relationship with government clients. Given that it is unlikely that HESCO can make significant progress to ensure higher collection rates from this class of customer, the recommended solution is to negotiate tax payment offsets under which unpaid bills are discounted from collections of local and federal taxes. In addition, a new financial framework is needed within HESCO and should include: 1. Updated accounting and internal audit procedures that more effectively serve the needs of the Board of Directors. 2. Improved transfers from external pay points to HESCO bank accounts. 3. Beginning preparations for design and implementation of an ERP platform with e-applications to serve all finance, accounting, commercial, human resource needs in line with control, management, and financial reporting to the HESCO Board of Directors, National Electric Power Regulatory Authority (NEPRA), and the Ministry of Water and Power (MWP) as needed. This would include developing an in-house IT support structure which would accommodate the service needs of the organization. 4. Insurance coverage for buildings, equipment, inventories, and other assets as deemed necessary to eliminate exposure to significant financial loss.
COMMERCIAL	While improvements to develop robust commercial system require extensive capital outlays such as metering and a new customer information system (CIS), there are a few steps that can be started immediately. Focus should be on reducing losses with meter readings audits performed by an independent party and recovering outstanding debts. Debt recovery can be

	as simple as working with the customer to develop a deferred payment plan with disconnection penalty for defaults. To improve efficiency and transparency, the revenue cycle requires many coordinated activities in order to be effective. Improvements in metering will be of limited value unless organizational and procedural changes are made in the meter reading auditing process to detect fraud or manipulation of the data. Implementation of a Customer Information System (CIS) will be more effective if new procedures for data collection, data transfer, and monitoring are developed. Because commercial management is the fulcrum of successful electric distribution utilities, commercial practices and procedures must be carefully designed and implemented with discipline and integrity in order to sustain the financial viability of the utility. 1. A consumer census to verify/add consumers. 2. Installation of a new Customer Information System. 3. Corporate reorganization so that all commercial activities report to the Director of Consumer Services. 4. Updated metering, using automated metering technology where appropriate. 5. Reorganized and updated meter reading routes. 6. Implementation of energy accounting. 7. Design of more comprehensive customer service and consumer awareness programs. 8. Enforcement of meter reading audits and meter inspection programs. 9. Establishment of a program of systematic meter repair, testing, and calibration.
HUMAN RESOURCES	HESCO management should launch change management program to create a corporate environment and employment conditions that enable *all* employees to: 1. Be aware of the corporate Vision, Mission and Goals. 2. Understand their roles & responsibilities in the organization and the value of their contributions to the company's success. 3. Have learning and growth opportunities for their talent development to succeed. 4. Have adequate delegation of authority in accordance with the responsibility to manage the assigned tasks 5. Have necessary work tools and equipments. 6. Be fairly compensated for their work with adequate benefits. 7. Feel engaged with their position and the company as their institutional home.

COMMUNICATIONS & OUTREACH	HESCO requires a pro-active communications and outreach plan to graduate to the level of a progressive service-delivery organization. It should: 1. Develop and execute an integrated communications and consumer outreach strategy to improve the interface with stakeholders 2. Strengthen and restructure the PR department with financial and functional authority to spearhead HESCO's communications 3. Realize the catalytic role of ICTs to execute an e-learning organizational culture, linking it to rewards and staff promotions 4. Design a calendar of outreach activities, engaging categories of consumers to build consumer trust and confidence in HESCO 5. Connect the staff through an intranet facility for storing and sharing information database, promoting ease of communication 6. Train its customer service staff in customer-centric communications skills and etiquettes

STRATEGIC DIRECTIONS

The value inherent in this report comes from its approach—a thorough and independent operational audit of all key areas of the company—and its candor. By speaking directly and without nuance to the array of problems HESCO faces today, the report lays bare what is wrong and what should be considered by HESCO management to fix it. The obvious downside of trying to address this many problems is that the "forest may be lost for the trees." Several management approaches can help counter this.

Importance of a Strategic Plan

A strategic plan is the best way to manage complex change, overcome complacency, galvanize the organization and gradually alter course. Creating a strategic plan for HESCO, adopting long term goals, and ensuring that all employees understand them will create a shared awareness and, even more importantly, shared accountability. Every employee should know what is important to the company, where improvement is needed, what they can do to help, and how progress will be measured. Without a strategic plan, it is hard to imagine how management can succeed in addressing the problems highlighted in this report, many of which have persisted for decades. A small number of long-term goals typically form the basis of a strategic plan. Meet an ambitious benchmark for power reliability, achieve a highly favorable customer satisfaction level, or achieve financial self-sufficiency for both operating and investment capital by a certain year—these are typical of goals that have been adopted by other major electric distribution companies around the world.

Benchmarking to Measure Progress

HESCO is in an ideal position to measure its changing performance objectively to judge whether its strategies are working. As one of eight Pakistani DISCOS, the company can compare its measured performance against a group of its peers within a common industry setting. Suitable benchmarking measures may include typical bill (cost for first 500 kWh of monthly service), ratio of employees to customers served, debt-to-equity ratio, and other widely used utility statistics, which are generally available. Long-term targets for improvement in any area should however come from high-performing utilities of comparable size and customer mix outside Pakistan. Several utility benchmarking organizations routinely publish such data for their subscribers.

CRITICAL SUCCESS FACTORS

Numerous barriers stand in the way of HESCO improving its operating performance and becoming financially self-sufficient. These may include complacency or unwillingness to change, policies that work against new approaches, lack of convincing leadership, or simply inadequate resources. However, some of

these barriers carry special importance for a company like HESCO and overcoming them will be critical to success.

Appropriate Use of Technology

HESCO's business processes are based heavily on manual processing, supplemented by information technology components that are legacies of the 1980's. While business procedures themselves may be reasonable, the growth of the utility has outstripped the ability of staff to perform many of the checks and balances built into the manual system, allowing for errors and potential manipulation of results. Moreover, time required to complete even the most routine customer requests, such as new account setup, is excessive.

It is evident that automation technology can play a major role in helping HESCO to leverage better performance. Processes can be streamlined and job tasks automated. However, the company may currently lack the organizational capability to successfully implement more advanced technologies that are being adopted by leading utilities elsewhere. Employees are not accustomed to learning how to use new systems and adapting their work flows to take full advantage of technology. Familiarity with computers, local area networks, and common desktop software is likely to be severely limited. Procedures that accompany technology-enabled business processes, e.g., backups, system modifications, to insure their robustness may be unfamiliar territory. *Accordingly, failure to allow sufficient time for rank and file employees to assimilate technology changes and participate in the redesign of their own business processes and work practices would put HESCO's technology investments at risk and technology projects could create problems rather than solve them.* In the near term therefore, emphasis should be on widely proven technology solutions that automate manual processes, especially in "back-office" systems such as customer information and full build-out of ERP. More sophisticated uses of technology can come later.

Fostering a Corporate Culture that Embraces Change

Obviously, setting a course for the future does not necessarily insure that the destination will be reached, or reached safely. In HESCO's case, nothing short of a dramatic change in corporate culture will be needed. All employees must feel that they are valued corporate assets in whom investments such as training will be made and whose welfare is considered vital. Leading utilities around the world empower their employees to identify problems, help devise solutions and receive recognition and rewards for doing so. These global leaders in the power sector have created cultures in which continuous improvement of work practices is the responsibility of every employee and no problem is too small to receive specific attention. Empowering HESCO's employees to participate meaningfully in the fundamental changes that lie ahead will help spur the move to a new and higher performing corporate culture.

In particular, HESCO leadership, starting with the CEO and Board, must embrace change; accept that incremental improvements will not be enough for the company to keep pace in the rapidly changing Pakistani power sector; and present change to employees as a positive force. To the extent that employees see this leadership, working to address the needs documented in this report, as a welcome, and long overdue, experience for most.

HOW THIS REPORT IS ORGANIZED

The main body of this report is organized in a way that is intended to highlight the current challenges HESCO faces and identify actions that can be taken to address them.

- Section 1 provides essential background on the utility industry setting in Pakistan, on Pakistani electric distribution companies in general and on HESCO in particular.
- Section 2 contains results of the operational audit in all functional areas, with bulleted summaries of findings in the front of each sub-section, followed by analysis and discussion.
- Section 3 provides recommendations to address current needs and improve operating performance. Key recommendations have been brought forward to focus attention and facilitate action.
- A detailed description of the PDIP audit methodology is provided in the Appendix.

1. INTRODUCTION

1.1 OVERVIEW

The Power Distribution Improvement Program (PDIP) is a USAID-financed project designed to facilitate improvements in electric power distribution utilities in Pakistan that was initiated in September, 2010 with a three-year duration. PDIP was designed to be implemented in two distinct Components, operational audits at each of the eight Government-owned distribution utilities (DISCOs) and development of performance improvement action plans for each DISCO. The second Component will focus on execution of the performance improvement action plans for each DISCO, including implementation of performance improvement projects for operational improvements.

The principal challenge of successful change management for each DISCO lies in transforming the management practices and the basic work culture of the utility to make it an effective, efficient and service oriented organization, including reining in its corrupt elements. The process requires that virtually all employees buy-in to the new, progressive vision of the organization, receive training in new methods of work and have the liberty of putting into practice the new concepts learned. To do this requires the input of intensive, specialized expertise as well as a DISCO management team committed to the change management objective. It also requires the Government of Pakistan (GOP) to create legal and political space for the management of the utility to operate in the most commercially rational manner, especially with full transparency and streamlined funds transfer arrangements within the energy sector.

Key performance improvement targets will be established on a case by case basis with each of the participating DISCOs to form the foundation of each respective Performance Improvement Action Plan, which will be jointly developed taking into account the results of a joint self-task force operational audit of each participating DISCO and other participating GOP entities. The purpose of these operational audits is to establish baseline information required to measure achievements under PDIP and other related programs. The audits will cover the managerial, operational, financial and customer service situation of each DISCO and include the identification of opportunities and methodologies that will be used to reduce technical and non-technical, e.g. commercial, losses and improve network, institutional, management and staff performance.

1.1.1 BACKGROUND

Industry Environment

Pakistan's Power Sector is beset by a number of significant challenges. These include availability of reliable and affordable electric power; modernization of the aging and inadequate transmission and distribution networks; and focusing on effective, efficient system planning, construction, operation and maintenance to achieve business objectives and customer satisfaction. With respect to retailing electric service to consumers, the challenges include control of an increase in unauthorized connections, elimination of collusion between employees and customers to reduce unauthorized use of electricity, and rationalization of retail electricity tariffs; promotion of a cultural change under a more conducive work environment and compensation packages to the employees; and introduction and enforcement of merit based selection of employees. With respect to regulation of service, the challenges include achieving a balance between business and social objectives, improvement of quality of service and technical performance standards, and introduction of advanced technologies.

The Power Sector is currently in a state of transition from the wholly Government-owned utilities to fully autonomous companies in power purchase, generation, transmission, dispatch and distribution. Initially the power sector was run as a monolithic organization under the Water and Power Development Authority (WAPDA). The WAPDA Power Wing provided the line and functional control of the Power Distribution Wing directing the operation of eight Area Electricity Boards (AEBs) at Lahore, Faisalabad, Gujranwala, Islamabad, Multan, Hyderabad, Peshawar and Quetta. In 1998, WAPDA was restructured along the now familiar lines calling for unbundling of generation, transmission and distribution. The

AEBs were converted into stock companies called DISCOS with all the shares held by the government, a regulatory agency was established [NEPRA], and a new entity, the Pakistan Electric Power Company (PEPCO) created to supervise the transition to full autonomy of the DISCOS. Twelve years later, the "transition" continues and autonomy remains an objective rather than a reality.

The government recently established a Transition Committee under the Deputy Chairman Planning Commission and is now working on a reform agenda for the entire power sector. The main objective is to achieve a deregulated power sector with independent power generation companies, a central power purchase agency, a transmission and dispatch company, generation companies (GENCOs) and fully autonomous power distribution companies. The National Electric Power Regulatory Authority (NEPRA) is already overseeing and approving the power tariffs and DISCO quality of service. NEPRA is also developing its role as a regulator and considerable capacity building, legal framework and policy reforms will be required to have a fully functional power sector. The roles of different agencies, although defined, are not properly implemented to enable a fully functional power sector.

The biggest challenge to the power sector is the increasing burden of fossil based power generation at high cost. Past policy decisions, intentional or otherwise, established natural gas with fuel oil backup as the primary power generation fuels. The failure to develop additional gas resources has increased the use of the fuel oil component of the mix, and a decision by the government to protect consumers from the full cost of oil generated power has resulted in an immense subsidy burden on the government. Financing the subsidy was left in part to the DISCOS with the result that a huge (over Rs. 300 billion) circular debt has been created. The continued adherence to building social objectives in the tariff design, huge wastes and inefficiencies, customer non-cooperation, lack of resources for system rehabilitation and expansion, and lack of a well designed and customer friendly renewable and demand side management program is crippling the power sector as a whole. Major changes are needed to make the Pakistan Power Sector healthy again.

Challenges Faced by Pakistan Power Distribution Companies

Pakistan's power distribution companies (DISCOs) were created as independent, state-owned utilities superseding the old Area Electricity Boards in 1998, with the goal of becoming fully autonomous government corporations after a transition period. While the DISCOs have increased autonomy in comparison with the old AEBs, they do not yet operate as fully autonomous, government-owned corporations. This is indeed one of the objectives of the newly launched electric power sector reform program. Towards this end, the Government of Pakistan (GOP) recently dissolved the Boards of Directors of the DISCOs and is in the process of formulating how the new directors will be selected and appointed. Selection of experienced professionals who are able to govern the DISCOs with integrity and impartiality presents one of the principal challenges towards creating highly functioning electric distribution utilities. The DISCOs must operate as independent companies fully responsible for their business activities according to well established business principles. As wholly-owned GOP corporations, it is not possible to completely prohibit political impact on the governance and operation of the DISCOs but political influence needs, nonetheless, to be minimized to allow these companies to behave as profit-making public service corporations.

DISCO retail tariff petitions are presented to NEPRA for review, evaluation, and final approval. NEPRA is a federal regulatory agency tasked with licensing electric power generation, transmission, and distribution companies, as well as regulating quality of service and evaluation and approval of generation, transmission and distribution tariffs. While NEPRA has the statutory authority to approve tariffs, MWP nonetheless controls the final tariff setting process by notifying the approved tariff to the DISCOs – essentially the MWP concessionaires through a tariff approval process. Given that GOP is highly sensitive to any upward tariff pressures, MWP has not yet approved application of the full cost of service for the DISCOs, nor has it allowed any tariff differences among the various DISCOS, regardless of differences in customer mix.

As a result of the political sensitivity to application of full cost of service tariffs, several DISCOs show negative financial results and will not be financially viable until and unless the tariff structure is adjusted to allow for higher revenue collection. Recent increases in tariffs have resulted in limited improvement in

the cash flow of some DISCOs. Application of true cost of service, making profits for reinvestment, and better employee and customer care remain among the principal challenges of the DISCOs.

Due in part to under-recovery of revenues, DISCOs have failed to invest in distribution system upgrades, and suffer from overloaded and deteriorating feeders and distribution transformers, inadequate metering and outdated technology. Automated asset management has not yet been implemented at any of the DISCOs. Preparation of expansion and rehabilitation projects by DISCO engineering departments is undertaken on an ad hoc basis, rather than as part of an integrated, annual planning process.

The organizational structure of the DISCOs is not conducive to smooth and effective utility operations. The policies and procedures need to be realigned to address process inefficiencies, as well as to introduce checks and balances for data integrity and improved financial controls. Realigning the existing manpower to meet future private sector utility operations will need to be directly addressed by each DISCO, but will likely take significant effort due to complications with unions and a significant change in organizational mentality. Bringing the DISCO's organizational and staffing structure in line with efficient and effective private sector utilities will be a great challenge.

The relationships of the DISCOs to the MWP will, without question, need to be realigned. Ideally MWP should establish a Board appointment process that is objective, transparent and non-politically aligned, and thereafter monitor DISCO financial health through an arm's length monitoring process. NEPRA, through its regulatory role, will continue to monitor quality of service and tariff-setting in the normal fashion practiced by regulatory agencies throughout the world. DISCO performance should be the purview of its management and Board of Directors; these are the corporate agents responsible for efficient operation of electric utility operation in well-functioning electric power sector environments worldwide, and this pattern would benefit Pakistan.

1.1.2 Purpose of Operational Audit and Improvement Action Plan

The objective of the HESCO Operational Audit was to evaluate the company's performance in engineering, finance, commercial and human resource functionality, as well as to gather and evaluate the baseline data and information that will be used to measure performance improvements in future years. Although in July, 2010, three circles of HESCO were administratively separated and a new distribution company namely SEPCO (Sukkur Electric Supply Company has been created but to date SEPCO has neither been issued a license by NEPRA nor enabling corporate environment has been created. So far all technical services and financial support are being provided by HESCO. For the purpose of evaluation, this report considers SEPCO as an integral part of HESCO since the legal and regulatory requirements for creation of SEPCO have yet to be fulfilled. The financial viability and sustainability of SEPCO as an independent entity is doubtful since the operating territory covers rural areas and have mostly domestic and agricultural customers that have subsidized tariffs.

With the goal of measuring the achievements under PDIP, the HESCO audit covered the managerial, operational, financial and customer service areas and identified opportunities and methodologies that will be used to reduce technical and commercial losses and improve network, organizational, financial, management and staff performance. The Operational Audit provides an objective foundation for HESCO's Performance Improvement Action Plan.

1.2 HESCO PROFILE

Hyderabad Electric Supply Company (HESCO) is a wholly-owned government distribution company with headquarters located in the city of Hyderabad, in Sindh Province. HESCO is responsible for supply of electricity to the whole of Sindh Province except for the metropolis city of Karachi which is served by KESC. It has boundaries adjoining MEPCO in the north and QESCO in the west. Its service territory is spread over about 137,387 sq. km.

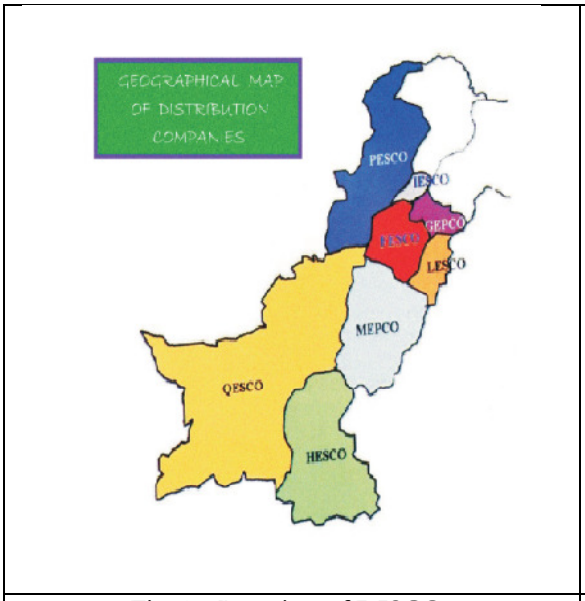


Fig. 1a: Location of DISCOs

Fig. 1b: HESCO area map

HESCO has administratively divided the 22 districts of Sindh Province into 6 operation Circles, 25 operation Divisions and 116 operation Sub-divisions.

TABLE 1.1: HESCO CHARACTERISTICS

No	Description	Value
1	Administrative Districts Served	22
2	Service Area (km²)	137,387
3.	Operation Circles	6
4	Operation Divisions	25
5	Operation Sub-divisions	116

1.2.1 General Description of Market

As of 30th June 2010, HESCO reported over 1.5 million registered customers. Approximately 81% of the customers are domestic. The other predominant category is commercial comprising of more than 16% of customers. It was followed by agricultural/tube well customers having a share of 1.7%. The industrial customers totaled 1.5% of all customers served.

TABLE 1.2: HESCO CUSTOMER DISTRIBUTION AS OF 30TH JUNE 2010

No.	Customer Class	Customers	Customer Mix %
1	Domestic	1,217,618	80.54
2	Commercial	243,765	16.12
3	Industrial	22,741	1.50
4	Bulk Supply	774	0.05
5	Tube wells	26,023	1.72
6	Other	957	0.06
	Total	**1,511,878**	**100.00**

Source : PEPCO Report on DISCOs Performance Statistics for the year ended June 30, 2010

Reported sales by customer category vary widely from the distribution of consumers. HESCO's primary clientele are domestic consumers accounting for about 51% of sales while commercial and industrial consumers have about 7% and 22% share of sales respectively. Sale to Bulk supply customers amounts to about 4% while those to agricultural consumers (tube wells) are about 14.6%. Table 1.3 provides a summary of sales by consumer category.

TABLE 1.3: HESCO SALES FOR 2009-10

No.	Customer Class	Sales GWH	Proportion %
1.	Domestic	2,738	50.73
2.	Commercial	361	6.69
3.	Industrial	1,175	21.77
4.	Bulk Supply	218	4.04
5.	Tube wells	786	14.56
6.	Other	119	2.20
	Total	**5,397**	**100.00**

Source: PEPCO Report on DISCOs Performance Statistics for the year ended June 30, 2010

1.2.2 Statistical Summary, Comparison with Other DISCOs

Some of the significant performance indicators for HESCO are shown in Fig. 1.4. HESCO's transmission and distribution losses at 34.8% are the second highest among all the DISCOs. The frequency and duration of outages is also quite high.

TABLE 1.4: HESCO 2010 KEY PERFORMANCE INDICATORS

No	Description	Value
1.	Transmission & Distribution Losses	34.8%
2.	Outages	
	Number of Outages	104,507
	Total Outage Time in Hours	40,294
	Hours per Outage	0.386
3.	Transformer Failure (% MVA)	4.8%

Source: PEPCO Report on DISCOs Performance Statistics for the year ended June 30, 2010

HESCO accounts for about 8% of the electricity distribution market in Pakistan in terms of number of customers and commercializes 8.5% of total energy sold in Pakistan. It contributes about 9% of the revenue billed but only 5% to the total revenue collected. HESCO's HT and LT network is about 16.5% and 10% of the total length of HT and LT lines indicating a low consumer density per km of line and a largely rural system. The transformer capacity is 9% of the total. HESCO is responsible for about 7% of the sanctioned load and 9% of total non-coincident peak demand of all the DISCOs.

TABLE 1.5: HESCO FY 2010 STATISTICS

Description	All DISCOS*	HESCO	Share (%)
Customers	19,582,224	1,511,878	7.72
Sanctioned Load (MW)	47,855	3236	6.76
Non-Coincident Peak Demand (MW)	19,288	1,797	9.32

Energy Sales (GWh)	63,660	5,397	8.48
Employees	122,530	15,807	12.9
Revenue (Million Rs)			
- Billed to Customers	488,022	45,945	9.41
- Collected from Customers	517,055	27,481	5.31
Receivables from Customers			
- Private	103,351	25,454	24.63
- Government	58,026	26,905	46.37
Total	161,377	52,359	32.4
Distribution Network			
- HT Line (km)	279,990	46,125	16.47
- LT Line (km)	205,020	20,998	10.24
- Dist Trans Capacity (MVA)	32,524	2,936	9.03

Source: PEPCO Report on DISCOs Performance Statistics for Year ended June 30, 2010
* Nine DISCOs Including TESCO.

HESCO's performance indicators show that it is lagging behind most of the other DISCOs. The issue of outstanding receivables is especially acute at HESCO. It accounted for 32% out of the outstanding receivables of all the DISCOs combined as of June 30, 2010. Its share in private sector receivables was about 25%. HESCO accounted for a whopping 46% of government sector receivables while the share of all the other DISCOs combined was 54%. This demonstrates a particularly worrisome trend.

HESCO is one of the prime candidates for improvement in operational efficiency. In year 2009-10, HESCO suffered a net loss of about Rs. 4 billion. Any improvement in HESCO's performance would significantly alleviate the subsidy burden on the national exchequer.

The purpose of this report is to explore HESCO's operating practices and procedures, to identify where HESCO should be able to make improvements in operating practices, and to document the specific policies, procedures, and operational practices that will need to be improved to contribute to lower operating costs, and improved overall financial and technical performance.

1.3 OVERVIEW OF PDIP AUDIT METHODOLOGY

The PDIP operational audit process was designed to facilitate data collection and to evaluate functional performance in close collaboration with DISCO management. The approach adopted was to evaluate operating performance by analyzing business processes and practices, and collecting information through one-on-one interviews with DISCO management and employees. The PDIP team not only collected operational data but also reviewed and evaluated management practices and processes to gain insights that could not be gleaned from statistics alone. For example, a key business process for all electric distribution utilities is the commercial revenue cycle – the means by which meters are read, bills are processed and delivered, revenues are collected, and delinquency notices are delivered.

The HESCO operational audit followed a process similar to audits undertaken of the other seven DISCOs. The process collected and evaluated data for multiple areas of electric distribution operations, including:

- Governance
- Organization
- Engineering
- Financial
- Commercial

- Human Resources
- Communications & Outreach

Comparison of performance indices for HESCO to those of highly functioning electric distribution utilities outside Pakistan highlighted functional processes that require improvement, while consideration of available best practices allowed the PDIP team to identify high impact performance interventions.

A complete and detailed description of the operational audit methodology followed is provided in the Appendix.

2. RESULTS

2.1 GOVERNANCE

2.1.1 Overview

The PDIP team evaluated the structure and activities of the Board of Directors of HESCO to understand the Board configuration and its level of autonomy and authority. Key findings and analysis of that review are presented in this section of the report. On November 22, 2010, all DISCO Boards were dissolved by order of the MWP, so many of the PDIP observations are no longer germane. However, in the interests of identifying potential improvement opportunities, findings of the review are presented herein.

2.1.2 Summary of Key Findings

The following are key findings of the PDIP review of HESCO's corporate governance:

- HESCO's Board has not been able to fulfill its governance responsibilities, lacking the expertise and authority to meet challenges facing the company in the changing Pakistani power sector. Board powers are limited and it is unclear whether the Board has the ability to tackle major issues or oversee strategic change.
- Review of Board minutes indicates that matters considered are largely routine and that there is little evidence of what might be called strategic issues being taken up by the Board.
- Declaring its intention to reduce the influence of the government in DISCO governance and move DISCOs toward greater operating independence, the MWP recently dissolved the HESCO Board from service and appointed a new Board.
- Guidelines for the newly reconstituted Board appear to provide a better mix of professionals and stakeholders.

2.1.3 Analysis & Discussion

The Board of Directors of each DISCO is governed by the Memorandum & Articles of Association, a document reflecting provisions described in the Companies Ordinance of 1984, as amended. The HESCO BOD consisted of seven members, including the Chief Executive Officer. Because HESCO is wholly owned by the government, the MWP appoints all public directors and PEPCO appoints all private directors according to a formula as follows:

- Four members from the public sector, including the CEO of the utility
- Two members from the private sector, of which one will be the Chairman
- One member from agriculture

All members are subject to MWP approval. The public members are joint secretary-level civil servants, and even the private members have government connections. All serve at the pleasure of the MWP, and, as noted above, can be replaced essentially instantaneously.

The Memorandum and Articles of Association require two meetings each fiscal year with other meetings held at the discretion of the BOD. One of the required meetings is a statutory meeting of the BOD that is convened after the end of the fiscal year to review and approve various items, including the state of affairs of the DISCO. This meeting is preparatory in nature to prepare board members for the annual general meeting of the shareholders and must take place within four months after the end of the fiscal year. The Board has not developed any of its own policies specific to the governance of an electric utility in general, nor to HESCO in particular, relying on the requirements of the Companies Ordinance 1984 and the Articles of Association of HESCO.

HESCO BOD has chosen to meet on a quarterly basis as required by Code of Corporate Governance although these rules are only applicable to listed companies in Pakistan. Review of the board minutes indicates that matters considered are largely routine, however, pertaining to approvals of procurements and other mundane matters, and that there is little consideration of what might be called strategic issues, which are properly the topics of BOD consideration.

In reality, BOD powers are limited and it is uncertain as to how well the BOD could cope with a requirement to consider strategic issues. For example:

- The appointment and evaluation of the performance of the Chief Executive Officer is perhaps the single most important BOD function in most corporations, but the CEO of HESCO is appointed by PEPCO, and a member of the BOD,
- Similarly, the entire senior executive cadre of the company is appointed by PEPCO rather than being selected or recruited
- Board members nominated from government agencies were senior in position, and therefore senior in chronologic age resulting in short board tenures and high turnover.
- The BOD used to have GM Finance PEPCO as its member who also heads the Board Audit Committee.
- Additionally the Deputy Chief Auditor and Manager Finance serve on the audit committee, which is a clear conflict of interest, and these individuals are not board members.

In an effort to understand just what powers the BOD actually has, the Book of Financial Powers (BFP) was reviewed and discussed with the Secretary of the BOD, who is also HESCO's HR Director. The BFP is a governing document and was approved by the BOD. The BFP establishes various approval authorities and monetary limits for financial transactions and certain other actions taken by HESCO management and BOD in the operations of day-to-day activities. HESCO has prepared a draft of proposed changes to the BFP to address more efficient approval authorities and adjust monetary limits to reflect the current financial environment. These proposed changes were made with regards to maintaining high corporate governance and internal control standards. This proposal was made in 2007 but has been delayed pending approval by PEPCO. It was the conclusion of the PDIP team that the HESCO BOD had relatively little authority over the management of HESCO and could not be considered a true corporate board.

As noted, in a notification from the Ministry of Water and Power (MWP) dated 22 November 2010 all DISCOs, GENCOs, and NTDC BODs were released from service on the DISCO boards. The order stated the intention to reconstitute the BODs "on professional lines" in accordance with the guidelines of the Cabinet Committee on Reforms with special emphasis on representation from consumers. Significant effects of the change include:

- Majority of directors must come from the private sector.
- Ministers/Secretaries/Government officials may not be nominated as Chairman of the BOD.
- Representation from the administrative Ministry/Division on the BODs of the DISCO is restricted to one.

This is clearly an action intended to reduce the influence of Government in the governance of the DISCOs. The notification should be considered a definitive step towards establishing the DISCOs as more independent public corporations. To serve the DISCOs in a professional manner, the new Directors will require training to strengthen their understanding of the role and function of independent boards of directors, as well as training to understand the commercial and technical nature of electric distribution utilities. PEPCO had previously been involved in BOD governance primarily as a manpower transition planning authority for the CEO and senior management. In addition, PEPCO also acted as an authority on any proposed new positions at the DISCO. This was a role PEPCO assumed during a transition period after DISCO formation and it never relinquished. A DISCO must be able to manage its

own manpower requirements. MWP has recently constituted new boards for all the DISCOs reducing the number of public representatives significantly to two out of fourteen and that is a welcome sign. However, MWP needs to delegate to the boards the authority for hiring and discharge of CEO, empower the boards and establish a term for the board members.

2.2 ENGINEERING REVIEW AND ANALYSIS

2.2.1 Overview

The PDIP review of engineering operations considered four components—transmission system management; distribution system management; mapping and power flow analysis to determine technical and commercial losses; and distribution standards, as described in detail in the Appendix. This section provides the findings and analysis that resulted from this four-pronged engineering review.

Hyderabad Electric Supply Company Ltd. (HESCO) is a Public Limited Company incorporated in April 1998 as an Electricity Distribution Company having jurisdiction in Sindh Province excluding Karachi which is served by KESC, a privately owned company.

In July, 2010, three circles of HESCO were administratively separated and a new distribution company namely SEPCO (Sukkur Electric Supply Company has been created but to date SEPCO had neither been issued license by NEPRA nor enabling corporate environment has been created. So far all technical services are being provided by HESCO. For the purpose of engineering evaluation, the combined data of HESCO and SEPCO is used as the bifurcation of SEPCO is in progress. The PDIP team considered the entire Sindh province as HESCO's territory serving a total of 1.5 million consumers out of which 60 % are rural customers having 4 % annual growth. Geographically, HESCO predominantly serves rural areas with 6 operation circles, 25 divisions and 116 sub-divisions with almost 46,125km of 11kV distribution line, 20,998 of LT lines, 3,774 km of 132kV and 1,777 km of 66kV transmission lines through 117 grid/substations. Peak demand for FY2009-10 was 1,868 MW with 5.2% growth and purchases were 8,275GWH, with an aggregate Transmission & Distribution loss of 34.80 %.

Predominantly HESCO serves more than 50 % of power to its domestic customers against around 22 % to industrial customers including bulk customers through 11 kV distribution network. HESCO does not employ a 33 kV distribution system to serve rural, remote areas as 60% of HESCO's customers belong to rural areas served by 73% of total 11kV feeders out of total 661 feeders.

2.2.2 Summary of Key Findings

Transmission System Management: The following are key findings of the PDIP review of HESCO's engineering operations in the area of transmission system management:

- **Network**—HESCO's transmission network is extensive and in the process of being upgraded. Losses of 3.6% are high, and service quality no doubt is marginal. HESCO's transmission system is not, however, a significant contributor to total system losses. HESCO has and is executing a plan for upgrade of its transmission network, so the analysis in this report focused on distribution.

- **Losses**—Current estimates of transmission losses appear to be reasonable in that they correspond with modeled values. Loss levels in the distribution system are extremely high and will require significant effort and financial investment to achieve desired reduction.

Distribution System Management: The PDIP review of distribution system management produced the following key findings:

- **Load forecasting**—A five-year electric load forecast is periodically created by NTDC using a trend-based method and provided to HESCO for use. This type of load forecast is widely recognized in the industry to have very low usefulness as it cannot reflect changing conditions or economic conditions. Moreover, five years is widely considered to be too short a timeframe for a load forecast given long lead-times for distribution facility planning and construction. The PDIP

team found no evidence that the data needed to prepare a more appropriate end-use or econometric forecast were being collected.

- **Feeder mapping**— HESCO understands the importance of system mapping as a planning tool and has instigated an effort to prepare distribution maps on a systematic basis. Unfortunately the process chosen is very laborious and the results are not as helpful as they could have been. Almost every operations subdivision has its own hand made single line drawings of the feeders in its territory without any geographical reference.

- **Feeder analysis software**—The software used by HESCO for feeder analysis is outdated and lacks many of the features found in contemporary distribution analysis software, such as direct input of Geographic Information System (GIS) mapping data, optimization of capacitor placement, analysis of looped systems, modeling of multiple feeders, and graphical presentation of results.

- **National design standards**—Current national design standards do not address congested area construction very well, and this is a problem in some urban areas served by HESCO. However, HESCO identified this need and has initiated an LT Aerial Bundled Conductor (ABC) program. This project has not gone very far yet, but will replace up to 1000 km of LT line with ABC. HESCO reports, however that this is an isolated project and does not reflect a change in standards to ABC type LT lines.

- **Construction quality**—There are in house and independent construction inspectors in the Project Division. Construction is carried out by the local contractors and the work is being inspected by M/s Barqab Consultants; another offspring of WAPDA legacy, and Project Division staff jointly. This approach has the predictable effect of uneven quality of construction. Poles were found to be not properly plumb, transformer platforms not level, and sags of conductors not even.

- **Work practices**—Construction and maintenance work practices in widespread use among HESCO employees are inconsistent, rely on makeshift and stopgap approaches and suffer from lack of available equipment and transportation access. The consequences of these failures are profound—employee safety is routinely jeopardized; worker productivity is low; response to customer requests can be exceedingly slow; and equipment failures occur more frequently than necessary. All of these direct consequences have negative financial impacts for HESCO.

- **Safety**—Eleven (11) linemen lost their lives while performing company work during the 2009-10 fiscal year. Improved work practices and safety policies would reduce this number and alter perceptions among the workforce that distribution maintenance and repair work is too dangerous to perform.

- **Meter security**—Meter security was found to be compromised by both the ease with which meter installations can be tampered and equally vulnerable service drops. Meter installations in rural areas are especially problematic.

- **Procurement**—HESCO conducts a large number of procurements annually, often for relatively small amounts. Also, procurement practices that are non-standard effectively preclude international companies from bidding, unnecessarily narrowing the competitive field and inhibiting potential savings. HESCO procured an unusually large amount of materials in 2009-2010 due to heavy flood damage sustained in Sindh Province.

- **Distribution Feeder Mapping and Loss Segregation**: Here are key findings of the review of feeder mapping and segregation of technical versus commercial losses based on the modeling and system loss analysis exercise on sample of four (4) HESCO feeders with a combined length of 285 Km having consumption pattern similar to that of the whole DISCO.

- Detailed modeling of distribution system losses indicates that technical losses on HESCO's system should be approximately 9% of annual energy (kWh). Benchmark technical loss is 8.4% based on sales per km of line.

- In contrast, HESCO reported total system energy losses of 34.8% in the 2009-10 fiscal year. If transmission losses were 3.6% as reported by HESCO/NTDC, the distribution component of loss would be 31.2%. The difference between the distribution technical loss of 9% and a probable total distribution loss of 31.2% is a non-technical (commercial) loss of 22.2%. This figure is likely to reflect large-scale meter tampering, illegal line taps and meter reading fraud aided and abetted by company employees.

- **Accordingly, a strategic opportunity exists for HESCO to reduce its commercial losses and significantly improve its financial performance.**

Distribution Standards: The following are key findings that resulted from visits by the PDIP team to the offices of NTDC, which plays a major role in national standards setting:

- Although there is considerable evidence that new distribution system design standards are required for electric service in congested areas, such as the old cities of Hyderabad and Sukkur, only focus was given to adopting LT Aerial Bundled Conductor (ABC) and no activity is under way to evaluate any other changes required in standards for this purpose.

2.2.3 Analysis & Discussion

The engineering assessment of HESCO consisted of three components. The first is an evaluation of transmission issues. The transmission system at HESCO was seen as a potential source of problem in addition to distribution system, having about 3.6 % of transmission and transformation losses which is high because of lengthy 66 kV system which comprises of almost 32% of the entire transmission network. HESCO has converted a number of 66 kV grid station to 132 kV under 6th STG program and are planning to convert the remaining 66 kV substations under 7th STG plan. This section of the evaluation is accordingly limited.

The second component is an evaluation of distribution system management resulting from a series of interviews with staff from the Planning and Design, Construction, Operations, and Procurement departments. During these interviews HESCO staff responded to the team's questions and provided insight into the technical operations of the utility. These interviews are inevitably colored by the attitudes of the interviewees, as well as the misunderstandings of the interviewers, and should be taken as indicative rather than absolute truth.

The third component consists of a mapping exercise and power flow assessment in which the team used a sampling technique to segregate distribution losses between technical and non-technical, and between the various components of technical loss. The team attempted to select 11kV feeders that were, in the aggregate representative of all HESCO's feeders and therefore indicative of the level of technical loss of the entire company. An even smaller subset of low voltage (LT) networks was surveyed in detail with the objective of identifying the contribution of LT systems to HESCO corporate technical losses.

Transmission System Management Assessment

HESCO has a transmission network of 3,774 km of 132kV and 1,777 km of 66kV lines totaling 5,551 km, receiving power from NTDC. There are 117 grid substations HESCO, with 84 of 132kV and 33 of 66kV. System peak demand is 1,868MW, a figure that is somewhat suppressed by load shedding.

HESCO prepares a five year plan covering the requirements of the 132kV and 66kV transmission system, using PSS/E, a widely utilized power flow software, to model the system. Total expenditures for the transmission network (STG) amounted to RS 732 million as opposed to Rs 670 million for distribution expansion and improvements (DOP&ELR) and Rs 2,697 million for rural electrification during FY 2009-10.

Total system losses in HESCO during FY2009-10 were 34.8%, as reported to NEPRA. A review of the data provided to the team on 11kV feeders indicates that distribution loss was 31.2%, leaving 3.6%% for

transmission loss. A preliminary estimate of transmission losses using estimated values and a simple model of the system indicates that the 66kV network, while carrying less than 20% of the system peak load is a significant contributor to transmission loss, accounting for almost half of transmission losses. HESCO is proceeding to convert the 66kV network to 132kV, which will reduce transmission losses substantially. In order to reduce transmission and transformation losses, HESCO has also installed 11kV capacitor banks totaling 106.8 MVAR at 21 grid substations during FY 2009-2010.

There was no compelling evidence that unaddressed transmission issues were contributing negatively to the financial performance of HESCO and it was decided early in the assessment to focus effort on distribution issues, which were clearly more demanding.

2.2.4 Distribution System Management Assessment

Planning and Design

Planning and design of distribution lines are carried out in the same department under the direction of a Chief Engineer of Planning and Engineering - Distribution. This department is responsible for planning of expansion and improvements to the distribution system and for designing those improvements so that they can be constructed by the Project Department. The planning environment at HESCO can be described as reasonably acceptable as under Asian Development and World Bank sponsored projects, a total of 68 feeders are being mapped manually on to the locally available municipality maps and planned using the legacy FDRANA analysis computer program. Asian Development Bank launched a project for low tension rehabilitation works whereas World Bank is sponsoring high tension augmentations and rehabilitations.

Distribution planning has traditionally been carried out in response to identified problems, but efforts are underway to develop new systems and improve old ones with the goal of developing an integrated distribution plan. H.T & L.T proposals have been generated to overcome the relatively high transformer failure rate, and for bifurcation of lengthy feeders for reduction of technical losses. 151 works under DOP & 214 Works under ELR have been generated and completed during FY 2009-10. A total budget of Rs. 668 Million was utilized for DOP and ELR works, roughly divided equally.

Area planning is done purely manually by suggesting physical bifurcation of existing feeders coupled with construction of new feeds either from the existing grid stations or from the new grid stations being constructed under 6th STG plan. Barqab Consultants has been tasked to carry out field survey of selected feeders and prepare augmentation/rehabilitation plans under Asian Development Bank and World Bank programs.

A significant gap in HESCO's planning activity is the execution of its rural electrification program. Investments in rural electrification in 2010 were Rs. 2,697 million, by far the largest category of investment by the utility. These projects were identified purely through political selection processes and no effort was made to determine whether the backbone systems from which they extend had adequate capacity. The result has been poor service quality for both existing and new consumers, and a serious problem of inadequate capacity throughout the system.

Comments on the various components of utility planning are as follows:

Load Forecasting

A five year load forecast is routinely prepared, however the determination of what growth percentages to use for the various customer classes is made by NTDC and communicated to the DISCO. No overt efforts at collection of load forecasting data, such as population growth, demographics, or historical sales data are carried out by HESCO. Data on sales by consumer class is supplied to NTDC, but the process is prescriptive once the growth factors have been received, that is the HESCO staff projects demand and energy requirements at the established growth rates, and then subdivides the resulting load among the various grid substations. Nothing further is done with the forecasts. NTDC also prepares a Power Market Survey report by compiling Grid/Substation daily peak load data and, based on historical growth, determines the Growth Factor to be used by DISCOs for planning new Grid Stations.

Mapping

The Chief Engineer Planning clearly understands the importance of system mapping as a planning tool and has instigated an effort to prepare distribution maps on a systematic basis. Unfortunately the process chosen is very laborious and the results are not as helpful as they could have been. Distribution circuits are hand plotted on paper copies of municipality maps and digitized into an AutoCAD system by Barqab consultants, a WAPDA foundation organization. For the same investment in effort, the development of a Geographic Information System (GIS) would provide considerably more capability. The resulting maps are used as if they were paper to derive line lengths for system analysis. This system serves the purpose for which it was developed, and is consistent with the limitations of the Feeder Analysis software, which only accepts manual entry of line segment lengths. The system has been used to prepare an integrated plan for the installation of some new grid substations, so it is certainly useful to the utility.

However, each subdivision has its own single line diagram of feeders, but no geographic maps exist anywhere in the company except those being prepared for 68 feeders under ADB and World Bank sponsored projects. When a feeder enters into an overload situation, defined as exceeding a peak load of 300 amps, or the operating subdivision suspects that a distribution transformer is overloaded, it advises the Planning department. The Planning department sends its surveyor to track the feeder, using the odometer on his motorcycle and other estimating means to assess length. The resulting track, along with conductor and transformer size information is hand drawn on taped together pieces of paper. The information provided by this map is then used as input to the analysis program. Once the issue that brought the feeder or the transformer to the attention of the Planning department is resolved, the project is archived and no effort is made to maintain or update the feeder information.

Establishment of a new grid substation is a more complex issue, in that many feeders must be mapped and many analyses done, but the outcome is essentially the same, i.e. no attempt is made to update the feeder information that is collected during the course of the project or to maintain any sort of map database.

System Analysis

The software used for distribution feeder analysis is called Feeder Analysis (shortened to FDRANA), and was developed during the 1980's under a USAID Power Distribution Program. It operates in MS-DOS and is capable of analysis of a single feeder and its branches, producing a tabular output that assesses voltage drop and calculates losses both for demand and energy. The software can model capacitors and also functions as a work order generation tool, with a database that can produce a material list for new construction. Produced as it was by USAID, the software has no cost to the utility and any number of users can be accommodated. This can be a problem in that multiple persons may have different versions of the same feeder model, leading to confusion during analysis.

While certainly advanced for its time, the software is currently outdated and lacking in many of the features found in contemporary distribution analysis software, such as direct input of GIS mapping data, optimization of capacitor placement, analysis of looped systems, modeling of multiple feeders, and graphical presentation of results. The software is also extremely laborious to use, as all input is manual and any changes in the system configuration require the creation of a new case, somewhat limiting the incentive to do alternative evaluations. The limitations of the software make it difficult to do multi-feeder area planning and exploration of system alternatives, which could result in sound distribution expansion, operation and maintenance. Also, though this program has the capability to determine distribution transformer losses connected on the feeder, but it is not being used as the users do not have the transformer specifications available and are not aware of the concepts of transformation losses. In number of cases, especially for urban distribution feeders, transformer losses are almost equal to the conductor losses. Mostly, focus is made on re-conductoring or bifurcation of the feeders.

The transmission department of HESCO, in common with that of other DISCOs has a license for PSS/E, the software produced by Power Technologies Incorporated and widely used in the US for transmission system analysis. Some consideration was given to using PSS/E for distribution planning, but this was abandoned due to the complexity of the software and lack of resources to renew software licenses. What is needed is an intermediate solution, that addresses the shortcomings of FDRANA while still being simple to use and low in cost.

Design

Design of distribution facilities is governed by standards published by the former WAPDA in the 1960's. These standards are based on HT lines with bare ACSR conductors serving relatively large (100 and 200kVA) transformers installed on overhead platforms which in turn serve three phase low voltage networks using bare aluminum conductors. In the case of HESCO, many customers have paid for installation of dedicated transformers ranging in size from 25kVA to 630kVA. In the vast majority of cases these dedicated transformers are installed in the same fashion as the public use transformers, i.e. on overhead platforms.

The only significant alterations in these standards since they were established have been the introduction of concrete poles. Prestressed reinforced concrete poles were initially approved, but design is moving toward centrifuged poles due to their higher strength and the resulting ability to carry three circuits. An additional change has been the adoption, in the 1980's of Osprey (556MCM 18/1) conductor for 11kV circuits with heavy electrical loading. Osprey has a current carrying capacity of 700 amps (13MVA at 11kV) so should provide considerable capacity. In actuality, the majority of HESCO's 11kV switchgear is limited to 400 amps per phase by the current transformers in the breakers, hence the need to consider circuit adjustment at 300 amps. This limitation severely limits the usefulness of the Osprey conductor.

The HESCO system is very congested in cities, especially in Hyderabad, and the national design standards do not adequately address the challenges they face. One area where HESCO has pursued and which has a positive and long lasting effect on their operations is the use of multiplex or Aerial Bundled Conductor (ABC) LT line. It would definitely help HESCO to reduce the possibility of unauthorized hooking, or *"kunda connections"* which are about 30 to 35% in Hyderabad city as reported by the staff. HESCO advises that the ABC project is a single effort and that they have no intention of changing LT standards to ABC.

Construction

The mission of the Project Department at HESCO is, as stated by the Project Director Construction that of preparation of feasibility reports for ELR, DOP and village electrifications. He emphasized that the Project Department does not do any design nor procurement but that it is responsible for getting the projects constructed through local prequalified contractors in HESCO. However, proposals are prepared for village electrification projects after performing physical survey of the area sponsored under MNA & MPA funds. The projects undertaken by the Project Department fall into three categories

- Projects funded from HESCO's budget for distribution upgrading and energy loss reduction
- Village electrification projects funded by MNAs & MPAs funds.
- Deposit work paid for by others, such as line relocation required by road widening or for the customer seeking independent feeder or for the housing societies.

Village electrification, which amounts to more than 80% of HESCO's construction activity, is considered deposit work due to the way in which it is carried out. There is no village electrification master plan, so the annual budget does not contain any expenditure for this purpose. Rather, a member of the national assembly identifies an area that they want to be electrified, and obtains the funding from the national or local government for the project. According to the rules governing these types of projects, HESCO can include in the budget for a village electrification project only those amounts that are necessary to construct the line extension. There is no planning study to determine what effects the proposed extension will have on the backbone system, or even whether voltage service will be adequate once the service is constructed. These problems are all left for HESCO to correct or accommodate during the operational phase. Members of the national/provincial assembly, depending on their influence or relationship with the government party, have allocations they can use to demand construction of projects.

For village electrification, the Project Department examines the locale of the project and prepares its own proposal and material list for drawing on stores. In many cases, according to staff, the total material requirements for a particular project are not available in stores, sometimes missing only a single class of item (bolts, or D-irons, for example), which then requires a delay in construction.

The Project Department constructs all projects with its own work force, with the exception of the setting of concrete poles which is contracted out. The Project Division is self inspecting, i.e., there are no construction inspectors as such. Each responsible foreman and line superintendent is supposed to inspect 100% of the construction, with higher level officers required to inspect declining amounts of the work. A field inspection of the HESCO system by the PDIP engineering team indicated that the work was found to be adequate but generally inconsistent and not as per Standard Construction Drawings issued by the office of the CE Design & Standards. Poles were sometimes not properly plumb, transformer platforms were not level, and sags of conductors were not even.

In particular, even though most of the older installations used connectors, none of the newer projects did. On new projects connections were wrapped or served, and full tension conductor splices did not use joining sleeves but were served as well. The use of served connections will certainly contribute to overheating in the future.

The Project Director Construction indicated that it was also difficult to keep linemen in the construction division. As soon as they attained their certifications as linemen, they would try to transfer to the operations divisions where the work is less strenuous. The Project Director cited instances in which political influence, even extending up to the Ministry level, was used to pressure the reassignment of linemen from the construction division to operations.

Operations and Maintenance

The fundamental organizational unit for operations at HESCO is the subdivision, of which there are 116 in the company, each serving at an average of 13,000 consumers. Operations subdivisions are defined geographically by feeder service areas and are grouped into divisions with approximately four to five subdivisions per division for a total of 25 operations divisions. Divisions are grouped into circles with approximately four (4) divisions per circle. HESCO has a total of six (6) operations circles. In addition to the operations division and subdivisions there are other divisions and subdivisions for Meters and Testing as well as for construction.

Hyderabad Circle-I was visited to understand how the area under jurisdictions is managed. This particular circle is having 388,562 customers out of which 81% are domestic consumers being served with five(5) divisions and twenty six (26) subdivisions with 13,035 distribution transformers of various capacities, 8,124 km of HT and 6,102 km of LT lines. Out of a total of 108 distribution transformers damaged during FY 2009-2010, 96 were of 200 kVA capacity, meaning the transformers serving domestic load, especially in the dense urban areas, are more likely to remain overloaded or unbalanced during summer season when the peak demand occurs. Last year the progressive losses were 32 % whereas this year it has improved to 30 % which is still very high for a predominantly urban circle. This high loss figure was attributed to old worn out energy meters, lengthy LT lines and service drops especially in the congested areas of the Hyderabad city with exposed LT tempting illegal tapping i.e. *"kundas connections"*. Transformers that fail in the field are repaired through local unauthorized workshops. Thereafter, they may be refurbished at the HESCO repair facilities at Kotri or Rohri due to unavailability of replacement transformers.

The principle activities of subdivision staff are as follows:

- Continuity of supply, or repair of system failures
- Meter reading
- New connections, but only for direct reading meters. All indirect reading meters (with current transformers) are installed by the Meter and Testing department
- Disconnection of defaulters for non-payment of bills
- Line maintenance, including line patrol and rectification of problems, as well as measurement of transformer loading

Each subdivision typically has approximately 70 staff, of whom roughly 60% are assistant linemen, linemen, or line supervisors, 15% are meter readers and bill delivery staff, 5-10% are complaint center

staff, and the remainder are managers or other support staff. It was stated that only about half of the linemen could be depended upon to carry out climbing duties due to age, infirmities and being overweight, although this could not be verified.

Each subdivision has a complaint center to receive and log complaints, and at least one lineman per shift to respond to them. The complaint centers receive complaints either in person or by telephone and record the complaint in rough form on note papers, transferring the information later to a ledger. However, in certain cases minor complaints of burnt LT jumpers are got locally attended by non utility staff especially in the rural areas. The complaint register was examined and found that most of the complaints are of high and low voltage jumpers, loose or excessively sagging bare conductors posing threat to general public.

PDIP engineering team visited Qasimabad sub division serving one of the heavily populated and quantum loss sub-divisions serving 15,000 legal and 10,000 illegal customers having almost 50% loss as reported by the sub-divisional office (SDO). The condition of the distribution system was very poor, illustrating clearly why HESCO reports more fatal accidents of non-employees than linemen. The FY 2009-2010 data show a total 49 fatalities, of which eleven were linemen. The remainder were non-employees – an alarming number of deaths due to the electric distribution system.

The PDIP engineering team visited a subdivision complaint center and encountered a lineman on call waiting in the complaint center to be dispatched. His tools were inspected and found to consist of a hard hat, leather and rubber gloves, a climbing belt, and a collection of hand tools such as pliers and screwdrivers in a small bag. All items were heavily used and the hand tools were in very poor condition, with taped handles, and dulled and notched cutting edges. The rubber gloves were for use up to 600V only, but were intact, without punctures or tears. The leather gloves were in very poor condition with holes and wear. If the rubber gloves were actually being used under the leather gloves it is difficult to see how they could be kept in good working condition, so either the rubber gloves are replaced frequently or they are actually not used very often. The latter is more likely.

In addition to the hand tools, the complaint center had some larger tools, including a grounding set, fiberglass ladders and various switch sticks and tree trimming hooks. The grounding sets were of a design that simply hangs on the conductor rather than being clamped to it, and are not adequate for personnel protection. The grounding set inspected had failed at the joint between the three leads and been repaired by wrapping the joint with aluminum wire. The ladders were fiberglass, of high quality, and in relatively good condition. The switch sticks were generally made with bamboo handles or with pieced together fiberglass handles. Neither type of handle had a surface finish adequate for use on high voltage lines. All of the switch sticks and ladders were stored in ways and places that exposed them to damage from other items lying against them.

The tree trimming hooks were dull and unlikely to be of any use whatsoever. The subdivision building was very cramped and in poor condition, and the stores area full of mainly debris such as broken insulators, recovered wire and hardware, etc. No doubt some of these items were to be reused to restore service, but there was little new material to be seen.

PDIP engineering team observed poor installation of energy meters vulnerable to meter tampering and energy theft. Terminal covers over the connections have always been a weak area for energy meters. In theory, a plastic one-way cover is provided with the meter such that once the connections are made, and the cover is pushed in, it cannot be removed without breaking it. Unfortunately, examination of a number of installations on the system indicated that the plastic cover is rarely pushed in, because the aluminum conductors tend to loosen with thermal cycles and must be periodically retightened. Of course, leaving the connections uncovered makes the meter vulnerable to the most basic forms of tampering.

The installation and the health of energy meters being used in the field was deplorable. Similarly, the use of service drop conductors that are neither concentric (protected by a concentric neutral shield against tampering) nor enclosed in a metal mast makes the entire service drop vulnerable to tampering with the cable. The picture below shows a number of meters with open terminal covers that cannot be considered secure or even safe for the general public in spite the fact that these are in service. PDIP team failed to

understand how these meters are being read. The following picture describes the typical installation witnessed by the PDIP engineering team in Hyderabad city:

Similarly, the installations of LT lines with bare conductor running so close to the buildings, easily accessible from the roof tops, tempting for illegal connections, in addition to posing safety hazards, are commonly seen and best described in the following pictures:

The subdivision had one or two light vehicles for general transportation, out of which one vehicle is reserved for the use of Sub Divisional Officer (SDO) and the second one is left for maintenance use. It was stated that the complaint center lineman and the meter readers use their own motorcycles to transport themselves, or walked. The division office has heavier trucks for transporting transformers and a crane for setting them. Given the shortage of transport, it is understandable that the trouble center lineman carries only his hand tools when called out. If more extensive work is involved than can be attended to by one man with a pair of pliers, it is necessary to program the work and utilize more personnel. It would be under these circumstances that the heavier tools, ladders, grounding sets, etc. would be used.

No regular line patrol/rectification, and transformer load measurement and balancing activity is planned or carried out by the subdivision maintenance staff. Line patrol is carried out as and when a problem is reported.

One of the maintenance objectives of the subdivision is to keep up a log of measurements of loading of transformers, and to periodically rebalance the loads so as to make the full capacity of the transformer available. Transformer load measurements are to be taken twice yearly and recorded in a ledger. Examination of the ledger in the subdivision office visited indicated that loads had not been regularly recorded for all the transformers in the subdivision on a regular basis. In practice, the subdivisions normally do not keep up the ledger and only check the loading of transformers when they suspect that one may be overloaded. This is clearly inadequate and contributes to the poor transformer reliability.

PDIP team witnessed that most of the 11 kV capacitor banks were disconnected. The reason given by the sub divisional officer was that these are all faulty capacitor banks. He also indicated that the line staff often disconnects these capacitors with the pretext of causing increased trappings.

PDIP engineering team is of the opinion that the poor condition in the HESCO sub divisions are due to inadequate line maintenance procedures and material availability, poor equipment and tools, political enrolments and over staffing. The field management has no protection against political victimization, thus causing a sense of insecurity. Also lack of motivation, training facilities and old electromechanical energy meters are the causes of poor operation.

The team also observed that issues affecting lineman safety in electric utilities are not unique to HESCO and usually fall into one of the following categories:

- Personal protective equipment that is either inadequate for the purpose, or difficult or unpleasant to use. The climbing belts and grounding sets used by HESCO fall into this category. The belts are too narrow and uncomfortable to lean into for any length of time, and the grounding sets are of a design that is completely inadequate for preventing electrocution.

- Shortages of personal protective equipment are such that jobs are attempted even in the absence of equipment. This may be an issue in accidents involving trouble call linemen, as they cannot carry all the necessary equipment with them due to a lack of transport.

- Construction standards do not consider maintenance requirements and do not provide adequate clearances for linemen to work or climb near energized conductors. This is an issue in HESCO as WAPDA standards are not adequately complied with.

- Inadequate tools for cutting, lifting, and pulling, requiring linemen to exert force, either pulling or pushing, that can result in injury if the load shifts unexpectedly.

- Poor tagging and clearance practices. It was reported that some line work is done during load shedding outages, without proper work permits preventing lines from being reenergized.

- Inadequate training in safety practices at lineman training schools. This needs further evaluation.

- Pressure from supervisors to sidestep safety procedures in order to complete work. This was reported by HESCO staff but needs further examination.

- Poor work planning procedures that do not consider safety as a goal of the project.

- Failure to maintain an environment in which safety is emphasized on a daily basis as part of the work schedule.

- Lack of sanctions for staff that knowingly violate safety procedures and by their example encourage others to do so.

Most of these issues are within the control of the management, and the engineering team finds it disingenuous at best to blame deceased linemen for their own fatalities.

The recently established Sukkur Electric Supply Company (SEPCO) has 686,000 customers and serves rural areas predominantly organized in three distribution circles. 81 % of the feeders serve rural areas, with 19 % of urban feeders. System losses for SEPCO are 43.53 % and recovery is just 27 % as stated by the CEO.

SEPCO receives technical support from HESCO including planning and engineering. Most of the rural areas are declared as no go areas especially after dark. PDIP engineering team wanted to visit SEPCO area as well but was advised otherwise by the CEO. Safety and security of the field personnel are the major concerns in SEPCO.

Meter Security

HESCO has not undertaken a large scale campaign to replace electromechanical meters with electronic units, and approximately 95% of meters remain electromechanical. This means that meter vulnerabilities at HESCO are the same as they have always been; attempts by the consumers to disable meters by tilting, dirtying, or otherwise stopping the meter disc, as well as gradual loss of meter accuracy over time as meters become dirty or are exposed to other hazards. A problem common to both new and old meters is the unauthorized access to meter bottom connections, a common risk with A-base meters.

HESCO's generally high level of losses indicates that these vulnerabilities are one of the major issues and observation indicated that most meters were poorly installed. Bottom connections on the meters were not covered or sealed, however, and HESCO does not have a meter testing and checking program, so older meters are likely to be slow or even dead. The inspection of the meter fleet indicates that meters are generally not secure and still constitute vulnerability for HESCO.

Procurement

Procurement is carried out by the Procurement Department. The Department prepares a procurement budget based upon the material issues during the last year increased by 10 %, taking into account requests from the Operations Department, and controlled by the available funds. In addition, the budget for new material is developed on the basis of available stock in stores.

Materials are divided among 29 categories according to a legacy WAPDA classification list, although in reality, only approximately 19 categories are commonly used. However, each category has sub-classifications which may be separately procured, and solicitations for any given subclass are held twice a year. The result is a large number of solicitations. The largest tenders are for distribution transformers while the smallest are for hardware items.

Most suppliers for items produced in Pakistan are Pakistani sourced. Although there is no prohibition against foreign suppliers, all suppliers must be prequalified and the process of prequalification, the small size of the procurements, and in some cases, the existence of special requirements tends to limit the interest of foreign vendors. For instance, transformers must be warranted against all hazards whether related to workmanship and materials or not, and damaged units must be replaced rather than credited. This is not a standard international commercial practice and has been accepted only by Pakistani vendors. Procurements for projects funded with donor funds (World Bank, Asian Development Bank, etc.) follow different procedures and are handled by the respective project management units.

The Procurement Department at HESCO is also responsible to procure the material for SEPCO, but materials pass from the direct control of the Department to the Operations department when they are transferred from central stores to the field stores associated with the operations circles. Once materials are transferred to a field store, they are generally not available for use in other circles even though a subdivision in a different circle may have needs that cannot be met by the relevant field store. The maximum material procurement is for village electrification. During FY 2009-10, the total procurement by this department was Rs. 2.97 Billion whereas as of October 2010, Rs. 1.163 Billion have been spent to procure different distribution material as HESCO territory was badly hit by the floods.

2.2.5 Distribution Feeder Mapping and Loss Segregation Analysis

As discussed in the Methodology section, the segregation of technical and non–technical losses for the HESCO distribution system is based on power flow models of a sample of feeders selected from within the HESCO distribution system. The process calls for selection of feeders on the basis of a consistent sampling method, mapping the feeders using a simplified Geographic Information System (GIS) tool, collection of feeder peak load and power factor data from substation feeder metering, and modeling of the feeders using power flow software.

The purpose of the sampling process is to evaluate system loss from valid sample of feeders selected to represent the characteristics of the HESCO distribution system– to develop a sample of models as a valid proxy for the technical losses of the entire system. The difference between the total distribution losses and the technical losses so determined can then be presumed to represent non-technical (administrative and commercial) losses. Further, the power flow model allows segregation of technical loss between 11kV lines, distribution transformers, LT networks and service drops.

Selection of Feeders

According to data provided during its annual business plan presentation in October of 2010, HESCO has 661 11kV feeders, totaling 47,038 km of line. Average feeder length is approximately 71 km. There are, however many feeders both considerably longer and shorter than this value, with different combinations of consumer load types. Clearly in order to select a sample of feeders that is representative of the utility feeder population as a whole it will be necessary to employ a sampling technique with specific criteria. The sampling criteria chosen were as follows:

- Average feeder length of sample population should be close to the average feeder length of the overall feeder population
- Distribution of sales in kWh/year between domestic, commercial, industrial, agricultural and other consumers for the population of sample feeders should be close to that of the overall HESCO feeder population
- The proportion of rural and urban consumers in the sample feeders should be similar to that in the system as a whole
- The sample feeders should have complete data, including total sales and feeder input data, total length. Feeders with data anomalies would be excluded
- Bulk supply industrial and dedicated feeders/consumptions were not considered

Data was obtained from HESCO on the entire feeder database. Because HESCO's customer information system links customers to the feeder that serves them, it is possible to obtain data on sales by feeder and this was also requested. HESCO feeders are classified as to whether they are urban (U), rural (R), industrial (I), or dedicated (D) to a single consumer. Issues with the data provided are summarized below:

- HESCO provided data for a total of 700 11 kV feeders against 661 feeders communicated earlier in October 2010, however 40 of the feeders were not considered due to incomplete data
- Similarly 43 feeders are missing input data from the grid station; therefore the losses could not be calculated for the entire system
- A total of 54 feeders showed negative losses whereas 46 feeders showed 0% losses
- 517 feeders present with losses in excess of 20 % out of which 81 feeders show losses between 20 to 30 %, and 253 feeders show losses between 30 to 50 %. 183 feeders show losses more than 50 %. This results in 74 % of feeders showing extraordinarily high recorded losses

After excluding feeders with anomalous or missing data, feeders were selected keeping in mind security and team safety issues. A final selection was made based upon a random sample taken from the population of potential feeders; three feeders were selected from three independent substations. After discussions with the HESCO CEO, a fourth feeder was added to the sample that satisfied the selection criteria. A comparison of the characteristics and sales proportions of the selected feeders, compared with the length and sales characteristics of the system, is shown in Table 2.1 below:

TABLE 2.1 CHARACTERISTICS FOR CIRCUITS INCLUDED IN THE GIS MAPPING EXERCISE

Feeder Name	Length	Demand	Sales MWH				
	KM	AMPS	DOMESTIC	COMMERCIAL	INDUSTRIAL	AGRICULTURAL	OTHER

Market Tower	8.8	370	11,946	4,033	206	14	77
Khattar	118.9	298	2,438	1,305	3,117	1,896	0
Khattian	91.9	150	3,856	301	1,474	3,004	0
Tando Jam City	8.28	236	7,424	1,094	935	0	0
Sample Average	57.0		59.5%	15.6%	13.3%	11.4%	0.2%
HESCO Average	**71.0**		**51.5%**	**8.0%**	**23.2%**	**15.5%**	**2.23%**

The length of the feeders chosen for mapping averages 57 km, compared to an average length of 71km for the system as a whole. The distribution of sales by consumer category is also slightly skewed with the system averages, with a greater proportion of domestic and commercial consumers in the sample than in – both due to the fact that the engineering team was constrained to work in specific regions of the system for personal safety purposes.

Mapping and Modeling of Feeders and LT Networks

The feeders were all mapped using a rapid GIS survey designed to identify only corner and intersection poles and poles with equipment installed on them. Observable data such as conductor size, transformer capacity, and transformer status, whether general service or dedicated, was noted manually and transferred to an attribute database. Once the circuit was mapped, the information was transferred to a Milsoft Windmil model. Milsoft Windmil is a standard distribution analysis software used widely in the US and Latin America. Windmil can model single or three phase loads, 60Hz or 50Hz systems and accepts user information on all conductors and transformer characteristics not in the default database.

The majority of the 11 kV conductors employed by HESCO are Osprey, Dog and Rabbit, with some Panther and Gopher, all of which are ACSR conductors. LT conductors are mainly Wasp and Ant, which are all aluminum conductors. Characteristics for these conductors were obtained from tables and incorporated into the database. Similarly, HESCO specifies transformers with maximum allowable levels of losses, a legacy of WAPDA procurement practices. The maximum allowable levels of loss have recently been changed, but none of the new units have been supplied yet. Transformer characteristics used in the model therefore correspond to legacy HESCO transformer values of no-load and load losses, as shown in the Appendix.

While Milsoft can accept data on location linked consumer loading, the time available for this project did not permit data on actual loading to be used in the model. Instead, the feeder peak load was obtained from substation records and this known load was allocated among the various transformers on the basis of transformer capacity, i.e. a transformer of 200kVA was allocated twice as much of the actual feeder demand as a 100kVA transformer.

Another matter that was considered was the power factor value employed by the model. Substation meters record kWh and kVARH, from which power factor could be calculated, however, only circuit amperes and kWh readings are actually recorded by the substation operators. The engineering team obtained station log sheets from the period around the feeder summer peak. Estimated average hourly power factor was computed by calculating kVA using logged amperes and an assumed bus voltage of 11.5kV and the differences between the hourly kWh meter readings to estimate kW.
Preparation of data indicated that the method used to determine power factor was not entirely satisfactory, probably due to variations resulting from manual reading of the substation meters. Rather than generalize what may be an exceptional value for power factor, and due to the small sample, it was decided to use 80% as the power factor for all feeders in the analysis.

Once the model, loading, and power factor are established, the feeder power flow analysis can be carried out. Table 2.4 below shows the results, disaggregated by line (conductor) loss, and transformer no load and load loss.

TABLE 2.4 MODEL RESULTS BY FEEDER

Feeder	Length KM	Peak Demand kW	Line Loss kW	Transformer Loss	
				No-Load kW	Load Loss kW
Market Tower	8.83	5,639	209.2	21.8	111.4
Khattar	118.92	4,826	623.7	38.5	59.3
Khattian	91.86	2,286	75.2	29.8	30.2
Tando Jam City	8.28	3,597	104.5	17.0	96.7

While these results assess the line and transformer losses of the feeders, it is necessary to evaluate the losses of the LT networks and the service drops to obtain a complete picture. Because the number of LT networks on any of the feeders is substantial, it was necessary to carry out a sample survey. A total of five LT networks was mapped and modeled. The process of mapping differed from that used for the 11kV feeders in that for the LT networks, the mapping included a consumer census of all the consumers fed by the network. In addition, a meter reader accompanied the survey team, carrying with him the meter read route book from June 2010, the month of assumed peak demand. It was therefore possible to obtain and record in the GIS database for the LT network the metered consumption for each consumer.

Since the majority of the consumers located on the LT networks are billed by kWh consumption only, it was necessary to covert the kWh data to demand (kW) for modeling. As no measurements of actual demand were available, it was necessary to estimate demand using only the average energy consumption of the consumers. In order to determine the peak demand in kW likely from consumers on each LT network during the month of June, the data on consumption was applied to the demand equation below. This equation was derived many years ago by the Rural Electrification Administration (REA) in the United States, and has been verified by NRECA as acceptably accurate for use in developing countries as well. The equation is as follows:

$$D = N*(1-0.4N+(N^2+40)^{0.5}) \; 0.005925*C^{0.885}$$

Where:

D= Monthly peak demand in kW for a particular group of consumers
N= Number of consumers in the group
C= Average monthly consumption per consumer in kWh/mo

The demand value calculated by the equation was applied as the source demand for the particular LT network, at the power factor of resulting from the HT model, and the demand allocated to the segments of the LT network in proportion to the kWh of the consumers connected to that segment. The result is shown in Table 2.5 below:

TABLE 2.5 RESULTS OF LT ANALYSIS

Feeder Name	U/R	LT Length	Transformer Size	LT Source Load	Source p.f.	Total Losses		
		KM	kVA	kW	%	kW	%Loss	W/kVA
Tando Jam City	U	0.877	200	165	81.4	9.374	5.68%	46.87
		0.353	200	145	80.0	2.582	1.78%	12.91
				Average Urban			3.73%	29.89
NTPS_Khattar	R+U	0.633	200	28	89.6	0.29	1.04%	1.45
		0.236	100	33	89.6	0.109	0.33%	1.09

	Average Rural		1.33
	Average All LT	**2.21%**	**17.65**

The results of the LT analysis show that LT losses vary from 0.33% to 5.68% of the power delivered by the transformer. Average loss for the LT network is 2.21%. The lengths of both urban and rural LT networks were on the order of 525 meters per transformer, although one of those sampled was 236 meters. Loading for this group of transformers varied from loads of no more than 14% of capacity to 82.5% of capacity. Of the transformers chosen, none was over loaded in June 2010. It is clear that only a relatively few of HESCO's transformers are likely to be overloaded.

For purposes of this analysis, it is necessary to generalize these results so that they can be applied to all general use transformers on all the modeled feeders, so as to obtain a value for LT losses. A value of average loss of 17.65 watts per kVA of general use transformer capacity was developed. As can be seen, there is considerable variation in the value of this parameter from one transformer sector to another for the urban transformers, and more uniformity for the rural transformers.

Service Drop Loss

Service drop losses were calculated on the basis of the assumption that most domestic sales used single phase meters, while all commercial and direct reading industrial sales used three phase meters. At some time in the past, an effort was made to move meters to the base of the pole as opposed to being mounted on the exterior of the residence. This had the effect of shortening the effective length of the service drop from the utility's standpoint, to something less than 10 meters. Examination of the system indicates that this process has not been completed in many urban areas, and the meters are still located on the exterior of the buildings. For this reason, the average service drop length has been assumed to be 12 meters. Table 2.6 provides characteristics by consumer type.

TABLE 2.6 CHARACTERISTICS OF SERVICE CONDUCTOR

Consumer Type	Service Wire	Cores	Service Type	Length M
Domestic	7 x 0.052	Two	1 Ph	12
Commercial	7 x 0.052	Four	3 Ph	12
Industrial	19 x 0.052	Four	3 Ph	12
Agricultural	19 x 0.083	Four	3 Ph	12

Average service loading was determined using the REA equation described above to calculate the total demand of the consumers of each class on each of the modeled feeders. Knowing the number of consumers of each type on the feeder allowed for an average demand per consumer to be calculated. Three phase loads were assumed to be balanced.

Loss Summary and Segregation Analysis

Once the components of demand loss have been calculated, it is necessary to convert the values derived from demand loss on peak to average energy loss. Because losses are a function of the square of load, it is necessary to account for the variation in load during the course of a year. The standard way in which this is handled is to determine a loss load factor based on the annual load factor of the system. The standard form of this equation is

$$LLF = K*(ALF)^2 + (1-K)*(ALF)$$

Where:

LLF= Loss Load Factor, or the load factor of the on-peak losses
ALF= Average annual load factor for the element under consideration

K= A constant <1.0 such that loss load factor approximates the results of an analysis of loss curve shape for the system in question. Most common values of K range from 0.7 to 0.9

The PDIP team used substation log sheet data to estimate the shape of the loss curve for the sample feeders in the HESCO system. A value of K of 0.84 was found to provide the closest match for the loss curve of the sample feeders. The resulting loss load factor equation is therefore:

$$LLF = 0.84*(ALF)^2 + 0.16*(ALF)$$

Annual load factor was computed for each feeder on the basis of the data supplied by HESCO and the loss load factor calculated according to the given equation. The same feeder loss load factor was applied to all components of loss. The results for the sampled feeders are shown in Table 2.7 as follows:

TABLE 2.7 RESULTS OFPRELIMINARY LOSS ANALYSIS BASED ON A SAMPLE OF FOUR FEEDERS

Feeder Type	Conductor Loss %	Transformer Loss %	LT Network Loss %	Service Drop Loss %	Annual Energy Loss %
Total Sample	4.9%	2.2%	1.8%	0.1%	9.0%

It should be noted that, due to the disparity between the average length of the sampled feeders and system average, conductor loss was corrected to reflect the loss of a feeder of average length.

Because the sample was chosen to be representative of HESCO as a whole, the interpretation of this result is that the technical losses of the HESCO distribution system are in the range of 9%. As noted above, HESCO had actual distribution system losses of 31.2% excluding transmission & transformation losses in the 2009-10 fiscal year. The difference between the distribution technical loss of 9% and the total distribution loss of 31.2% is a non-technical loss of 22.2%. This is a relatively high proportion of non-technical loss and it is quite clear that non-technical losses account for the majority of potential loss reduction in HESCO.

Validation

HESCO, in its report of October 2010 to the Ministry of Water and Power reported system losses of 34.80% inclusive of Transmission & Transformation, distribution, technical and administrative losses. In order to validate the results presented here it was decided to carry out an independent evaluation using a benchmarking technique developed for electric systems in the rural US. Studies conducted by the Rural Utilities Service, the financing and monitoring arm of the US rural electric program, have determined that for systems using conductors and voltages typical of good engineering practice, distribution system loss is a complex function mainly of sales density that is MWh sales per km of line. The equation developed based upon that parameter is as follows:

$$L= (-1.8458*(LN(H7*1.609))+17)$$

Where:

L= Total losses (technical and non-technical) in percent
H7= Sales density in MWh of sales of all types per km of distribution line
LN= Natural logarithm function

For purposes of this analysis, distribution line is considered to include both HT and LT line. The tendency of this equation is to assess higher losses for utilities with lower sales densities, that is, for utilities with dispersed consumers and low sales in MWh/km of distribution line, losses are higher than for utilities with more dense service areas. Thus increasing the amount of distribution line considered tends to increase the allowable level of losses.

Applying this equation to HESCO results are as follows:

HESCO BENCHMARKED LOSSES

HT & LT Km	Sales Density MWh/Km	Benchmark Technical Loss %	Actual Distribution Loss %
78,422	68.8	8.3%	31.2%

It is apparent that, according to this benchmark, HESCO should have a distribution loss of approximately 8.3%, a value which is in relatively close agreement with the assessment of technical losses presented in this report.

Possible Technical Opportunities for Reduction of Non-Technical Loss

The high loss of HESCO, both technical as well as administrative, demands concrete efforts to reduce and bring it to an acceptable level. Potential opportunities are as follows:

- Mapping of lines and consumers using a GIS provides important information for use not only in planning, but also in monitoring of transformer loading. Accurate location of consumers with respect to the feeder and transformer that serves them allows for better tracking of feeder losses and can aid in identifying areas where theft is high, as well as provide a means for evaluating the impact of other improvements.

- Open conductor LT line is notoriously vulnerable to unauthorized hooking or "kunda" connections. Replacement of at least some of the open LT system with covered multiplex conductor would assist in limiting loss from this source.

- The engineering team was advised that approximately 95% of HESCO meters are still of the old electromechanical type, and these are notorious for slowing as they age and for vulnerability to tampering. While wholesale replacement of these meters with electronic units may be more expensive than HESCO wishes to undertake at the present time, a campaign for calibration of the existing meters would have immediate results at much reduced cost.

- Meter reading improvements that minimize the number of error prone manual transcriptions of data would help minimize errors and assist in identifying problematic meters for replacement.

Another technical measure that, while having minimal effect on losses will improve customer service and reduce resistance to payment, could be as simple as installation of connectors on all high current joints. The type of connectors used should be compression connectors which can, in most cases, be installed with hand tools. Compression connectors are much cheaper and more reliable than bolted connections.

2.3 FINANCIAL

2.3.1 Overview

The financial management operational audit was designed to evaluate the effectiveness and efficiency of financial management for HESCO. The audit process has been designed to evaluate operational control against standards set by the management. Factors included in the audit process include long range plans, budgets, and operating policies and procedures. The financial information presented in this report, except for the data provided in Table 1.5, is supported by the June 30, 2010 audited financial statements. The financial information presented in Table 1.5 was compiled by PEPCO from separate documentation submitted by DISCOs.

2.3.2 Summary of Key Findings

The following are key findings of the PDIP review of HESCO's financial management.

Cash Receipts and Disbursements:

- HESCO's collection rate for government clients is much lower than it is for private clients; the collection rate for government clients is 18.2%, while HESCO has a collection rate for private clients of 72.5%. GOP accounting regulations prohibit making provision for past due receivables

from government clients and therefore HESCO must consider all government receivables as collectible.

- HESCO is forced to remit payments for GST on all billings, regardless of whether the bills are actually collected. Thus, even though taxes are considered a pass-through, the difference between billed and collected taxes is paid from company's distribution margin. These taxes represent a significant financial burden.

Financing and Investments:

- HESCO, though it has revenues of Rs. 64 billion ($US 762 million) per year, could only afford to undertake about $16 million of system investment in 2009-10. This level of investment is insufficient to maintain the distribution infrastructure over the long term. A total of $31 million was invested in politically motivated and poorly planned village electrification projects, which, due to low sales and high losses are a threat to HESCO's financial condition.

Internal Controls:

- Internal Audit only functions as a financial control in the review and certification, certain consumer electricity billings and financial transactions. Moreover, the external auditor is unable to rely on the work of Internal Audit due to the function's lack of independence and professional competence. The existing audit manual does not address the specific audit procedures that will be required to perform internal auditing procedures as the organization has evolved and new system processes have been introduced.

- There is concern with the lack of training and professional competence within the Internal Audit function.

Cost Containment:

- HESCO's vehicle fleet consists of a total of 811 vehicles; 296 of which are 20 years of age or older. The company's fleet management policy requires vehicle replacement when a vehicle reaches ten years of age, however vehicles are rarely replaced on schedule due to conflicting approval policies. Even if HESCO were to demonstrate that purchase of a new vehicle would result in lower operating and maintenance costs, there is no policy which would allow for the replacement of a vehicle. Not surprisingly, older vehicle maintenance costs are significant.

- HESCO has significant financial exposure due to a lack of insurance on its facilities. Grid stations and certain new vehicles are presently the only facilities covered by insurance.

- HESCO is currently paying PEPCO approximately Rs. 9 million per year as a software license fee for three applications (billing, payroll, and inventories).

Financial Reporting:

- The current accounting system is unable to meet the growing needs of HESCO. HESCO is an entity which comprises of geographically disbursed cost/revenue centers. There is extreme complexity in the number and type of transactions and data which flows between the various regions and headquarters. In addition, there are numerous offices which require an integrated information system solution. HESCO is currently evaluating the implementation of an ERP solution.

- HESCO continues to use a legacy WAPDA accounting manual that has become increasingly outdated due to changes in accounting practices in Pakistan. The HESCO Finance Director is in the process of updating the manual.

Financial Performance:

- The current ratio is an indication of an entity's ability to pay its current debts now. Generally, a ratio below 1.0 means an entity may have trouble paying its current debt obligations. HESCO's current ratio of 0.79 needs periodic monitoring should its financial position worsen.

- Maintenance expense as a percentage of operating revenue indicates that HESCO is spending significantly less than US rural electric cooperatives to maintain its electric system, 2.41% for HESCO compared to 7.98% for rural electric cooperatives. However, this is somewhat explained by the fact that HESCO has invested a significantly smaller amount in total utility plant per kilometer of line than US rural cooperatives.

- The plant revenue ratio (total utility plant/operating revenue less cost of power) indicates HESCO has significantly less operating revenue remaining after power costs to support its existing plant through operations and maintenance expense when compared to rural electric cooperatives, 10.6 for HESCO and 6.3 for U.S. rural electric cooperatives. A smaller plant revenue ratio indicates higher revenue per unit of investments in plant. U.S. rural electric cooperatives have invested significantly more in total plant per kilometer of line than HESCO, Rs. 2,622,327 for rural electric cooperatives and Rs. 923,639 for HESCO.

- The amount of trade debt receivables over 60 days as a percentage of operating revenue is significantly higher for HESCO than for US electric cooperatives: HESCO's trade debt to operating revenue ratio is 3.8%, while the US electric cooperative average is 0.23%. This comparison is based upon FY 2010 HESCO trade debt.

- US electric cooperatives' consumer density averages 8 consumers per kilometer, while HESCO has 32 consumers per kilometer of line. The large US cooperatives have consumers to employee ratios of 467/1, while HESCO's consumer to employee ratio is 94 to 1. Even though HESCO has the next to the lowest average in consumers per employee when compared to other DISCOs (see Table 10 below), it could improve its financial position significantly by improving its consumer to employee ratio. Were HESCO able to achieve a consumer to employee ratio close to 467:1, the savings would approach Rs. 2.6 billion per year.

2.3.3 Analysis & Discussion

Financial management responsibilities rest with the entire HESCO management structure. However, direct responsibility for overseeing financial management lies with the Director of Finance who is responsible for providing leadership with regard to management of and direction of cash receipts and disbursements, financing and investment management, internal control, cost containment and financial reporting. This report highlights the important aspects of each of these functional areas.

Cash Receipts and Disbursements

HESCO receives cash from various pay points including banks, post offices, and NADRA, with methods of payment including cash and online banking. All payment collection centers are required to transfer funds collected (net of collection fees) to the respective HESCO central bank account. HESCO receives 74% of its deposits the same day in its bank account; 10% of deposits, primarily from offline banking, are received within two to three days after payments have been made. The remaining 16% of deposits, received from post offices, take up to a week to be transferred to the HESCO primary bank account. HESCO then makes daily payments from central bank accounts to PEPCO/CPPA without deducting any distribution margin and subsequent requests are made for the remittance of funds to cater for the operational expenses at HESCO. While improvements can be made to enhance cash transfers, a significant portion of payment receipts are transferred to the HESCO account on a timely basis.

Currently, excess capacity (demand) cost charges can only be passed through on a quarterly basis while excess energy fuel cost charges are passed through on a monthly basis. The loss of time it takes to recover excess capacity charges is a cost in the loss of cash flows.

HESCO annual reports show significant trade debt receivables. HESCO makes provision for doubtful trade debt accounts using the following policy:

TABLE 2.9 TRADE DEBT PROVISIONS FOR DELINQUENT CONSUMERS

No	Category	Value (%)
1	Disconnected consumers	100%

2	Government receivables 1 – 3 years	10%
3	Government receivables over 3 years	15%
4	Consumer receivables 6 to 12 months overdue	10%
5	Consumer receivables 1 to 3 years overdue	20%
6	Consumer receivables over 3 years overdue	40%

In fiscal years 2009 and 2010, a provision was recorded as an expense in the amount of Rs. 1,549,950,948 and Rs. 2,017,209,697, respectively. In fiscal years 2009 and 2010, the trade debts that were written off were Rs. 3,823,585 and Rs. 752,600, respectively. Provision expense is included as an operations expense for purposes of Distribution Margin (DM) and the size of the provision expense may have an impact on the amount of DM received. In an analysis of FY 2010, trade debt receivables over 60 days as a % of operating revenue, HESCO was significantly higher at 3.8% as compared to US electric cooperatives at 0.23%.

Following the policy illustrated in Table 2.9, HESCO accumulates provisions for past due accounts receivables under the observation that these accounts are uncollectable. The cumulative total provisions at HESCO amount to Rs. 14,368,382,849. Given that HESCO considers that these accounts are uncollectable, it makes no further attempt to collect them. Alternatively, HESCO could consider engaging a collection agency to make further attempts to collect against these accounts, paying a percentage of the collected total towards achieving the collection targets paid on a contingency basis.

Additionally, HESCO receivables from Sindh government accounts equal Rs. 25,790,073,763. The HESCO collection rate for government clients is much lower than it is for private clients; the collection rate for government clients is 18.2%, while HESCO has a collection rate for private clients of 72.5%. HESCO does have a policy to make provisions for uncollected government accounts as per table 3.1. A legal remedy will be required to force the government to pay past due debts – or perhaps to allow a tax offset against aging, unpaid electric bills.

HESCO and other DISCOs are required to retain and later, pay taxes and license fees to local and federal agencies as a function of commercializing electric power. Some of the taxes that are due to the government are assessed on the basis of electricity sales rather than receipts against billings. The following describes amounts collected monthly in addition to the consumer electric bill:

- General sales tax (GST) assessed at 17% on domestic consumers and export industries.
- Income withholding tax: 5% and 10% retained at for industrial and commercial consumers, respectively.
- Excise duty of 1.5% on all consumers (varies by local jurisdiction).
- A flat fee of Rs. 35 on domestic consumers to support the national television network.
- Surcharges may be assessed as needed to cover the costs of certain power plant projects.

Given that GST is levied on the basis of billings, the DISCO is forced to remit payments for GST on all billings, regardless of whether the bills are actually collected. Thus, even though taxes are considered a pass-through, the difference between billed and collected taxes is paid from the DISCO's distribution margin. These taxes represent a significant burden for those utilities with low collection rates. The net general sales tax payable was Rs. 6,969,236,868 at FY 2010.

The company owes to CPPA against the Power Purchase Price Rs. 85,992,236,544 and Rs. 51,443,240,368 for FYE 2010 and 2009, respectively. These receivables remain on the ledger due to HESCO's inability to collect past due amounts from the Sindh Government and subsidy amounts due from Government of Pakistan.

Financing and Investments

Electric utilities are capital intensive operations, requiring a regular and dependable stream of long term financing at reasonable rates in order to be able to undertake system improvements when prudent and necessary. HESCO's financing needs are only met through long term financing arranged through the government. Long term financing may be typified as World Bank, or Asian Development Bank lending, but in reality, these funds are actually lent by the donor to the Government of Pakistan who on-lends them to the DISCO. Subject as they are to the geopolitics of government and multilateral bank relations, the availability of such financing is not related to the financial strength or the particular needs of the utility, is always project specific and cannot be relied upon to be available when needed by the DISCO.

Local banks are not likely to be enthusiastic about extending long-term credit to the DISCOS, since, as government entities they are subject to political requirements that are not always aligned with the DISCO's individual financial sustainability. HESCO's balance sheet does not allow arranging funding on commercial terms from the local Financial Institutions.

Generally, cash flow generated by operations is satisfactory only for meeting short term needs, essentially making HESCO an operations oriented entity. One of the reasons that system planning is so constrained is the shortage and uncertain availability of significant investment funds. HESCO, though it has revenues of Rs. 64 billion ($US 762 million) per year, could only reliably undertake about $16 million of system investment in 2009-10. Nonetheless, HESCO was provided with funds for village electrification projects in the amount of $31million in 2009-10. These projects are identified by various government entities, including members of parliament, and tend to be poorly planned and inadequately funded. The consumers served by these projects are almost all within the low-consumption tariff class and therefore generate little revenue. The significant increase in rural consumers has, however, stressed HESCO's operations capacity and is no doubt a factor in HESCO's high non-technical and financial losses.

All DISCO investment projects are required to be filed with the Planning Commission (PC), Central Development Working Party (CDWP) and Executive Committee of National Economic Council (ECNEC) for approval regardless of funding status. Each project is evaluated on a cost benefit basis and only projects that have a calculated benefit proceed. The documentation required for these filings is burdensome regardless of the funding source. The Finance Director would like to see the process streamlined to minimize documentation and reporting requirements, especially for those projects with no government funding.

The weighted average cost of capital (WACC) is used in the computation of rate of return on rate base. It is a blended rate of the cost of debt and the cost of equity. This rate is then used to compute the rate of return on rate base. HESCO's rate of return on rate base may range from 13%-17%.

Internal Control

The team visited regional warehouse site location and reviewed policies, procedures and operations. The HESCO warehouse procurement policies are provided for under the Public Procurement Regulatory Authority (PPRA) manual. There are two distinctly different warehouse operations, one for 11 kV distribution system materials, and the other for 132 kV transmission materials. The 11 kV warehouse operations consist of two regional warehouses and 13 field warehouses. The HESCO annual financial audit included observations with regards to the store shortages receivable from employees for Rs. 8,353,502 FYE 2010. The store shortage investigations are performed based on the WAPDA manual of General Rules, Guidelines for Enforcing the Responsibility for Losses sustained by Authority through Fraud and Negligence of Individuals 1982. The HR Director states that there are approximately 150-200 investigations per year. The audited financial also has a reference for provision for impairment of Rs. 60,831,667 in stores and spares. The stores/warehouses should have insurance coverage to cover up the loss sustained by the company.

It was noted that the value of obsolete items accounted for approximately 10% of the Hyderabad warehouse. While the Board of Directors has the authority to approve write off amounts, action will not be taken without PEPCO approval.

The Book of Financial Powers (BFP) is a governing document and was approved by the Board of Directors of HESCO. The BFP establishes various approval authorities and monetary limits for financial

transactions and certain other actions taken by HESCO management and the Board in the operations of day-to-day activities. The BFP was reviewed and discussed with the Finance Director as to the adequacy of the monetary limits. HESCO has prepared a draft of proposed changes to the BFP to address more efficient approval authorities and adjust monetary limits to reflect the current financial environment. These proposed changes were made with regards to maintaining high corporate governance and internal control standards. This proposal is pending for approval by PEPCO.

In a review of the Internal Audit (IA) function, it was determined the IA operations employs approximately 111 people out of a total of 132 sanctioned positions. IA continues to employ the WAPDA audit manual dated August, 1985. In addition to the WAPDA audit manual, IA uses a Revenue Audit Manual issued by WAPDA in June 1998 to replace Chapter 1 and Chapter 6 of the Audit Manual. The Revenue Audit Manual was designed to assist in the review and certification of consumer electricity billings and to report to Management about the status of compliance of policies and procedures regarding commercial operations. The functions of the IA Division, as defined in the Audit Manual under section 2.1 states, "Internal Audit Division has to ensure that rules and orders framed/adopted by the Authority from time to time in connection with execution of works, pay and allowances, stores, etc. and for maintenance of various accounts, books, etc. are followed by all WAPDA formations/offices and the defects and irregularities noticed in such accounts/ books are rectified as far as possible". However, IA only functions as a financial control in the review and certification of consumer electricity billings. The external auditor is unable to rely on the work of IA due to IA's lack of independence and lack of competence. The existing audit manual does not address the specific audit procedures as the organization has evolved and new system processes have been introduced.

The Finance Director was very concerned about the level of organizational employee competence and the lack of job descriptions with which to evaluate employee performance. The lack of job descriptions by which to evaluate employee competence puts the organization at risk in the performance of its duties.

Cost Containment

Cost containment refers to the process of identifying expense items and categories that offer opportunities for significant savings through identification of alternative sources for goods and services. DISCOs have historically been required to employ WAPDA services for software and other services that are not cost competitive with other private sector sources. The application of WAPDA requirements is not uniform across all DISCOs, so opportunities for savings may vary from DISCO to DISCO.

In the case of HESCO, vehicle fleet maintenance costs were discussed with the Director of HR. The HESCO vehicle fleet consists of a total of 811 vehicles; 296 of these vehicles are 20 years of age or older. The HESCO fleet management policy requires vehicle replacement when vehicles reach ten years of age, while the private sector practice usually requires replacement after five years of age; this occurs due to a ban on new vehicle purchase established by PEPCO. Even if HESCO were to demonstrate that the purchase of a new vehicle would result in lower operating and maintenance costs, there is no policy which would allow for the replacement of a vehicle.

With a high number of very old vehicles, vehicle maintenance costs are significant. HESCO has come up with an innovative, and questionable, plan to re-condition their older model vehicles. The new body and engine is placed on the old chassis of the vehicle in order to enhance the useful life of the vehicle. The metal fatigue of a 20 year old vehicle may be a safety concern. Regardless, the HR Director seems to be satisfied with the outcome of this exercise and a number of vehicles have been re-conditioned by this process.

Financial Reporting

The accounting functions continue to depend on manual processing. HESCO is presently using certain stand alone software applications such as inventories, payroll and billing licensed by Power IT Company, a PEPCO company. The database generated by this stand alone software requires manual entries to the general ledger.

The audited financial statements for the year ended June 30, 2010 have been qualified with regards to Capital Work in Progress. The qualification states "Capital Work in Progress includes job valuing Rs. 902.643 million that have since been completed but could not be transferred to fixed assets due to

pending finalization of physical verification by the outsourced consultants. Further, jobs of Rs. 237 million that were identified in previous years but located by the management during the last year also remained outstanding due to the same reasons. The related depreciation expense could not be quantified. The subsidiary record of capital work in progress is not fully reconciled with the control account balances as the reporting date." Failure to properly capitalize and depreciate assets has the effect of understating expense on the income statement.

All DISCOs were required to convert to the NEPRA Uniform System of Accounts by December 31, 2010. The new chart of accounts is more detailed than HESCO's current chart of accounts. HESCO was on target to meet the December 31, 2010 deadline and should provide additional management reporting detail.

HESCO continues to use a legacy WAPDA accounting manual that has become increasingly outdated due to changes in accounting practices in Pakistan. The HESCO Finance Director is in the process of updating the manual.

Financial Performance Indicators

Financial performance indicators provide a means of measuring distribution utility performance as a function of other, similar high-functioning electric distribution utilities. Use of performance benchmarks requires establishing a reasonable baseline for comparison – that is, finding a group of electric utilities that are of similar size and characteristics (geographic scope, gross sales, sales density, etc.). While the DISCO community in Pakistan provides a reasonable peer group for comparison with one another, it would take more time than is available to identify an ideal group of high-performing electric utilities that are quite similar across many characteristics.

For purposes of comparison, PDIP proposes to use financial and technical performance characteristics of the large group of rural electric utilities in the United States. These utilities are small in comparison to the Pakistan DISCOs; have far fewer consumers per kilometer of distribution line; but are characterized by low line losses, extremely high collection rates and have been financially self-sustaining without capital or operating subsidies. For purposes of this comparison, the largest of the US rural electric distribution cooperatives were selected for this benchmarking process. These cooperatives range in size from slightly more than 80,000 consumers to over 200,000 consumers; DISCO sizes range from 400,000 to over 3 million consumers.

The current ratio is an indication of an entity's ability to pay its current debts now. Generally, a ratio below 1.0 means an entity may have trouble paying its current debt obligations. HESCO's current ratio of 0.79 needs periodic monitoring should its financial position worsen.

Maintenance expense as a percentage of operating revenue indicates that HESCO is spending significantly less than US rural electric cooperatives to maintain its electric system, 2.41% for HESCO compared to 7.98% for rural electric cooperatives. However, this is somewhat explained by the fact that HESCO has invested a significantly smaller amount in total utility plant per kilometer of line than US rural cooperatives. The plant revenue ratio (total utility plant/operating revenue less cost of power) indicates HESCO has significantly less operating revenue remaining after power costs to support its existing plant through operations and maintenance expense when compared to rural electric cooperatives, 10.6 for HESCO and 6.3 for rural electric cooperatives. The rural electric cooperatives have invested significantly more in total plant per kilometer of line than HESCO, Rs. 2,622,327 for rural electric cooperatives and Rs. 923,639 for HESCO.

Given the very low consumer density per kilometer of line, the level of line losses for US rural cooperatives (5 %) should present a reasonable target for overall technical losses for DISCOs. Line loss in excess of 5% could therefore be viewed as non-technical losses, and an opportunity for operational improvement.

The amount of trade debt receivables over 60 days as a percentage of operating revenue is significantly higher for HESCO than for US electric cooperatives: HESCO's trade debt to operating revenue ratio is 3.8%, while the US electric cooperative average is 0.23%. This comparison is based upon FY 2010 HESCO trade debt.

US electric cooperative consumer density averages 8 consumers per kilometer, while HESCO has 32 consumers per kilometer of line. The large US cooperatives have consumers to employee ratios of 467/1, while HESCO's consumer to employee ratio is 94 to 1. Even though HESCO is above average in consumers per employee when compared to other DISCOs (see Table 3.2 below), it could improve its financial position significantly by steadily working to improve the consumer to employee ratio close to the US electric cooperative average. Were HESCO able to achieve a consumer to employee ratio close to the US average, the savings would approach Rs. 2.6 billion per year.

HESCO's negative equity and current year net income have resulted in a negative return on assets (3.95)%, equity as a % of total assets (13.6)%, and long term debt as a % of total capitalization (6.7)%.

TABLE 2.10: HESCO/US COOPERATIVE PERFORMANCE RATIO COMPARISON

Category/Performance Indicator	HESCO	US Cooperative Avg.
Liquidity		
Current Ratio	0.79	1.6
Amt over 60 days/Oper. Rev (%)	3.8	0.23
Profitability		
Return on assets	(3.95)%	5.07%
Op Rev/km line (Rs)	1,357,678	1,528,519
Consumers/km line	32	8
Consumers/employee	94	467
Main Exp/Op Rev (%)	2.41%	7.98%
Op Exp/Op Rev (%)	10.6%	7.03%
Cost of Power/Op Rev (%)	92.6%	70.55%
Plant Utilization		
PRR (one year plant rev ratio)	10.6	6.3
Total Plant/km line	923,639	2,622,327
Solvency		
Equity/Assets (%0	(13.6)%	42.4%
Long term Debt/Ttl Capitalization (%)	(6.7)%	52.0%
Line loss (%)	34.8%	5.0%
Elec Sales collected/Elec Sales billed (%)	42.3%	N/A
Government	18.2%	N/A
Non-government	72.5%	N/A

2.4 COMMERCIAL MANAGEMENT

2.4.1 Overview

This chapter describes HESCO's commercial management practices, followed by an analysis of the impact of selected changes to commercial practices. The policies, practices and procedures employed by HESCO are not unique to HESCO; they are in general common to all Pakistani DISCOs, varying in scale and in some particulars.

2.4.2 Summary of Key Findings

The following are key findings of the PDIP review of HESCO's commercial management.

- **New service connections** — The lack of meters delays the connection of new customers leading them to bypass the application process. For those consumers that do apply for new services, factors designed to minimize mistakes in the data entry into the billing system may contribute to significant delays in consumer billing – sometimes for several billing cycles. As a result, at the end of June 2010 348 newly connected consumers had received service for more than a year but have not received their first bill.

- **Meter reading** — Numerous problems were found in the area of meter reading. Commercial management and employees indicate that there is insufficient time to perform the randomized

evaluations of meter reading accuracy that are supposed to occur. Distribution losses are minimized by manipulating meter reading data. A reviews of meter reader logs revealed that meter readers do no consistently identify and record problems with meters.

- **Bill preparation** — The billing process involves manual data transfers and data entry from the meter readers to the revenue office, which often cause delays. Only 8 of the 25 Revenue Offices have the capability prepare electronic formats of the data required for bill preparation. Bills are prepared in batches for all division served by the computer center. Delays by a single meter reader can delay bill preparations for all divisions. Due dates are the originally scheduled dates and are not calculated from the date bills are actually prepared. The due date of the bill is frequently 8 days from the print date.

- **Bill delivery** — Inadequate time is allowed for bill delivery with the result that there are instances where bills have been delivered on or even after the payment due date. Delays in any part of the process will result in delays of delivery of bills to the revenue office where the bills are sorted and delivered to each subdivision. Bill delivery is by hand, so lack of transportation also routinely delays bill receipt and payment. NEPRA requires bills to be delivered to the customer at least 7 days before the due date.

- **Bill adjustments** —Customers can request a bill adjustment at the customer service centers. The customer service representative may adjust any bill by writing the corrected amount on the bill and then send an adjustment form to the revenue office. The adjustment made may not be done according to policy. The adjustment must be approved by the appropriate office before data entry. Since there may be a substantial time lag in processing the adjustment, the consumer may have to return for another billing adjustment. In simple terms, the company's back-office procedures do not follow through with actually adjusting the consumer records.

- **Payments** — The payment handling arrangement is also fraught with inefficiencies and requires frequent, manual intervention. The bank will not accept payment amounts less than the amount indicated on the printed bill. Collections are on a downward trend. HESCO's rate of collection for the period ending October 2010, FY 2010, and FY 2009 was 46%, 60%, and 68% respectively.

- **Disconnection/reconnection** — Because of the ease to directly connect to the system, HESCO frequently chooses not to disconnect defaulting customers. Without penalty for nonpayment, the customer continues to use electricity without paying. As of June 30 there were over 410,000 pending Equipment Removal Orders. The balance of receivable for those customers increased 7.5 billion Rs the time the ERO was issued to 48.2 billion Rs at the end of the FY 2010.

- **Accounts receivable**—HESCO' receivable balance at June 30, 2010 of 52.4 billion Rs. Constitute 32% of the total receivables of the GOP owned DISCOs. The government balance of 26.9 billion and the private consumer balance of 25.5 billion represent 590 and 317 days of billing days respectively.

- **Customer service** — At the local level, there are few dedicated customer service representatives. Personnel are assigned to man the windows for a few hours and then they return to their other duties; hence, there is little or no continuity in resolving customer issues. The current customer care system is practically nonexistent, creating customer frustration. An efficient and effective customer care system is needed by HESCO and its counterpart DISCOs.

- **Meter management** — Meter inspection, testing, and replacement are inconsistent at best. HESCO has a shortage of meters. At the end of June, almost 35,000 defective meters were still in service; more than 40% had been declared defective for more than three years. During the FY 2010, over 52,000 meters were replaced but only 13% of those replacements were for defective meters.

- **Advanced meter reading** — HESCO does not use advanced meter reading technology. This suggests that the meter reader has discretion in reading and manipulating the meter readings. With the manual meter reading processes, losses can be controlled by adjusting readings.

- **Theft control** — The lack of meters and other equipments has lead to many consumers directly connection to the system.. The ease in which customers can reconnect has made the disconnection process a worthless endeavor. The law and order situation hampers the disconnection process. Without support of the civil authorities, HESCO lodged few FIRs.

- **Meter integrity** — With the shortage of meters, HESCO is reluctant to declare any more meters as defective. Replacing defective meters is a performance indicator. A meter may be declared defective when it is actually working; the consumer is then billed on the average consumption of the last 11 months. Because it is the meter reader that declares a meter defective, it is possible for collusion between the reader and the consumer, especially during the peak season of summer. Since it takes months for the meter to be replaced, the air conditioning season is over before the consumer is billed on actual consumption again. Also, with many meters located 7-10 feet above ground, it is difficult to detect meter tampering.

- **Information technology** — Presently, HESCO business processes are characterized by manual and cumbersome practices, inadequate controls, insufficient commercial focus, limited transparency and lack of reliable information. The use of information technology to improve efficiency and effectiveness has not been employed. Several stand alone applications are not integrated either with other applications or with potential applications to be deployed in the future. Although the level of deployment of IT varies significantly from one DISCO to another, the key applications have been in multilevel aggregation of data or large-scale data processing. In other words, IT is being used as a tool to address a specific issue or two at a time and not as a long-term, holistic strategy to achieve fundamental business goals. HESCO's move to a computerized environment is an opportunity to rationalize and update core business processes as a prerequisite to further automation.

2.4.3 Analysis & Discussion

The revenue cycle in DISCOs, including HESCO, is governed by three documents, including:

1. Commercial Procedures, 6th edition-November 2000, plus amendments which have not been codified;
2. Consumer Eligibility Criteria, 2003; and
3. Consumer Service Manual, 2010.

The Commercial Procedures manual is a true procedures manual developed by USAID in the 1980s and is still the primary document for carrying out commercial activities. Revisions that have been made primarily raise authorization limits and reassign signing authority as needed.

In response to the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the Act), the National Electric Power Regulatory Authority (NEPRA) developed the Consumer Eligibility Criteria manual in 2003 to ensure a non-discriminatory provision of distribution service and sale of electric power to all consumers within the service territory of a distribution company. This document is included as an appendix to the Consumer Service Manual.

The Act also led NEPRA to prepare the Consumer Service Manual that provides instructions and a code of conduct and procedures for dealing with the consumer. The Consumer Service Manual describes the obligations and rights of the consumer, as well as the rights and obligations of the DISCO. The timeframes for processing consumer applications, for completing service connections, meter reading, bill processing and delivery, and for resolving complaints are addressed in the manual. The manual also includes safety and conservation tips for the consumer. The frequent clause, "(DISCO to insert its name)" implies that all DISCOs are to follow the policies stated and not develop their own.

Overview of Revenue Cycle

The HESCO (and other DISCO) revenue cycle is composed of a number of interrelated steps. The first step – perhaps a pre-revenue prerequisite, is the application for service connection. There are non-recurring fees assessed in the application and connection process, so this is in fact a part of the revenue cycle process. Once a consumer has received a service connection and begins consuming electricity, the DISCO revenue system must collect consumption data, process the data, print and deliver the bill, and collect revenues from the consumer. Each step requires a structured set of actions that must be orchestrated to allow the DISCO to manage an extremely high volume of transactions on a monthly basis. The following sections of this report describe each step of the revenue cycle for HESCO; much of this information applies to all DISCOs, since they use very similar commercial practices.

New Connections

The first step in revenue cycle management is to register and connect the consumer. The location associated with the meter is identified as the consumer; that is, the premise is assigned a billing account number. Should the occupant of the premises change, the billing account number does not follow the consumer, and the name associated with the number is changed. Numbers are assigned in the walk order of the meter route. As new structures are added, the route must be renumbered to adjust to the additional locations; the consumer is assigned a new account number.

HESCO's new connection policy is similar for general and industrial consumers. The difference is in the documentation required and who has the authority to approve the application. General consumers (domestic and commercial) can apply for service at the local subdivision office. Large consumers must apply at the planning department office located at the headquarter complex. Once the application and the terms of agreement are completed, signed and appropriate documentation attached, the application is assigned a registration number.

Within two weeks of receiving a consumer application, the subdivision is to conduct a site survey to determine if there is sufficient capacity for new load and prepare the cost estimate for the connection. General consumers who are within 40 meters of the connection point are charged a flat fee. A demand note for the connection fee and another demand note for the security deposit are prepared and sent to the consumer. The consumer has 30 days to pay the demand notes at the pay point specified. Once payment has been made and the subdivision office is notified, the consumer is added to the queue for new connections. New connection efficiency is measured by the length of time from payment of the demand notes until the consumer is connected and billed.

A service connection order (SCO) is prepared after the fees are paid. The meter, cable, and necessary materials are drawn from stores, and the connection is installed. Unfortunately, the materials needed are often not available for several months after payment of the demand note. There is no communication between stores and the personnel preparing demand notes. Inventory has a computer system, but it is not integrated with any other system. The consumer will still pay his note in order to get on the priority list for installation. Management reports that there is pressure to expedite certain customers. When the consumer finally gets connected, the completed SCO is sent to the revenue office to enter the consumer into the billing system.

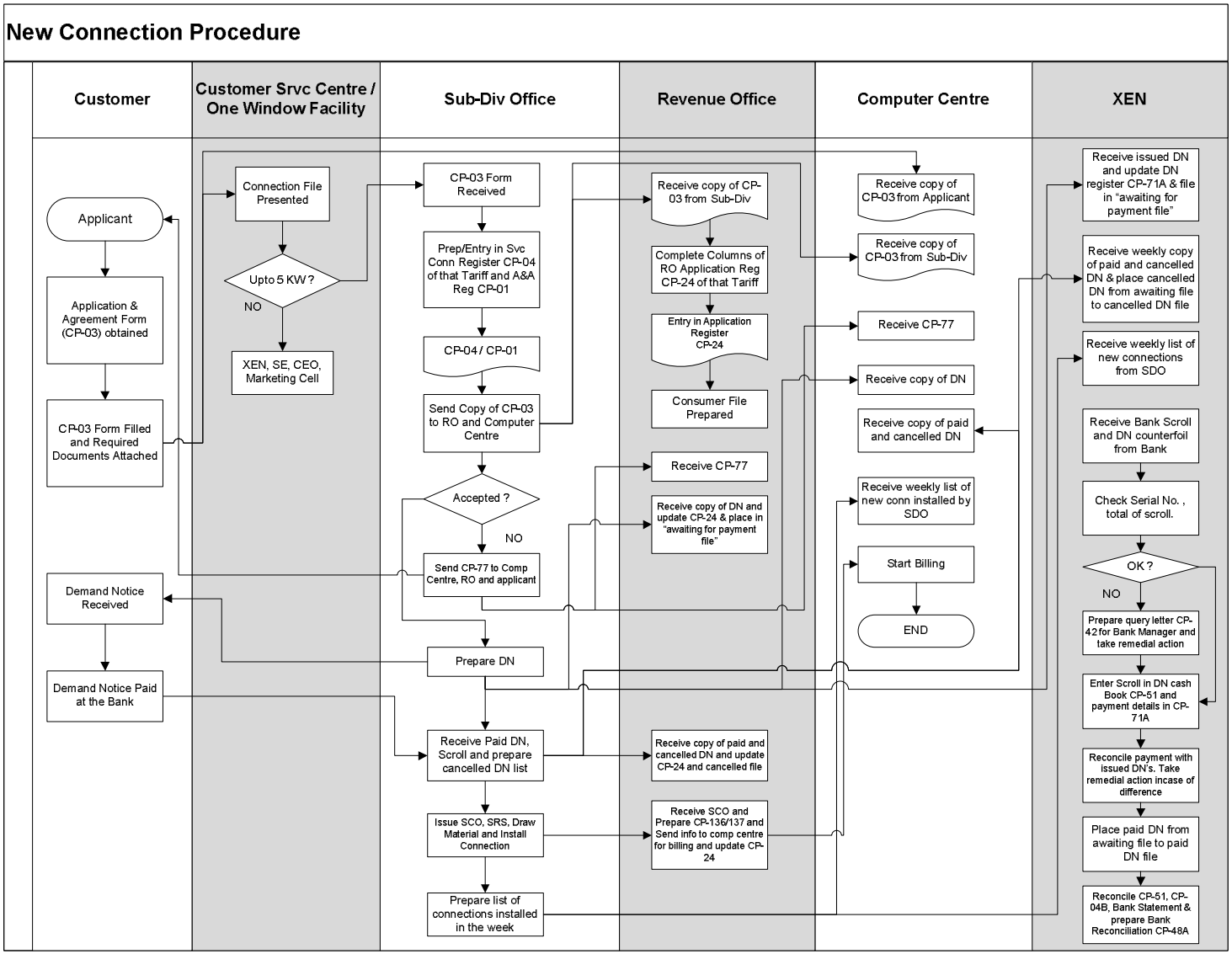
HESCO follows the prescribed process to some degree. The target is to have new connections installed 35-45 days after the registration of the application. However, the target does not take into account the delay of payment by the consumer or the shortage of material in the warehouse. A review of one subdivision's register used to notify the revenue office showed connections paid for in 2007, 2008, and 2009 were finally completed in November, 2010. At the end of June 2010, 5340 connections were pending. Due to the delays in completing new connections, consumers have opted to create their own connections rather than apply to HESCO.

Several factors designed to minimize mistakes in the data entry into the customer information system unfortunately result in significant delays in consumer billing – sometimes for several billing cycles. The transfer of documentation needed to include the new consumer in the billing system is low priority for the technical personnel and is usually done once a month. At the end of FY2009-2010, 348 customers had been connected for over 1 year and had yet to receive the first bill. Even if the SCO is transferred immediately, it still may take HESCO two months to process the first bill.

TABLE 2.XX Billings of New Connection Delay			
>1 month and up to 3 months	>3 months and up to 6 months	>6 months and up to 1 year	Over 1 year
1029	790	239	348
Source: PEPCO DISCO Performance Statistics June 2010			

The delay in billing the consumer is the result of the process. SCOs and a transmittal form for new connections are sent once a month to the revenue office. The revenue office prepares an input sheet of new connection data. This information is sent in electronic format to the billing center. The billing center then prints a "pre-bill" listing so the revenue office can verify that the data is correct. If the data is not correct, the errors are corrected, sent back to the billing center, and a pre-bill list is printed again. Once the data is verified and accepted as correct, the first billing cycle may have passed. Because the meter reading list is prepared days in advance, the new consumer may have missed the first billing cycle by a matter of a few days. Fig 2.1 illustrates the new connections procedures.

Figure 2.1 New Connection Process



Meter Reading

Effective, efficient, and reliable metering and recording of electric power consumption is the heart of the electric power distribution utility commercial system. Many utilities experience significant difficulties in the meter reading process, including inaccurate or faulty meters; human error in recording and/or transcribing meter reading data; delays in recording and transferring metering data; and, meter reading fraud involving consumers, meter reading employees, and third parties.

There are a variety of strategies that can be employed to address problems with meter reading, including auditing meter readings; rotation of meter reading employees; outsourcing meter reading services; use of advance metering technology, including automated meter reading, and/or use of pre-paid meters. Each option and technology comes with an associated cost and vulnerabilities; no single approach is fool-proof, although some are less problematic than others.

HESCO has checks and balances in the meter reading policies and procedures in an effort to ensure robust and trust-worthy metered data from the consumers. Unfortunately, this is the area of commercial operations for which there is a high degree of distrust and anecdotal information regarding employee manipulation. It is important to note that, the purpose of this report is not to present evidence of fraudulent practices, nor to make unsubstantiated claims; the purpose of the report is to identify problems that affect DISCO performance, and to identify solutions to the problems that are noted.

The Commercial Procedures Manual requires routine verification of meter readings and bill deliveries as shown in Table 2. 11:

TABLE 2.11 METER READING AUDITING PROCESS

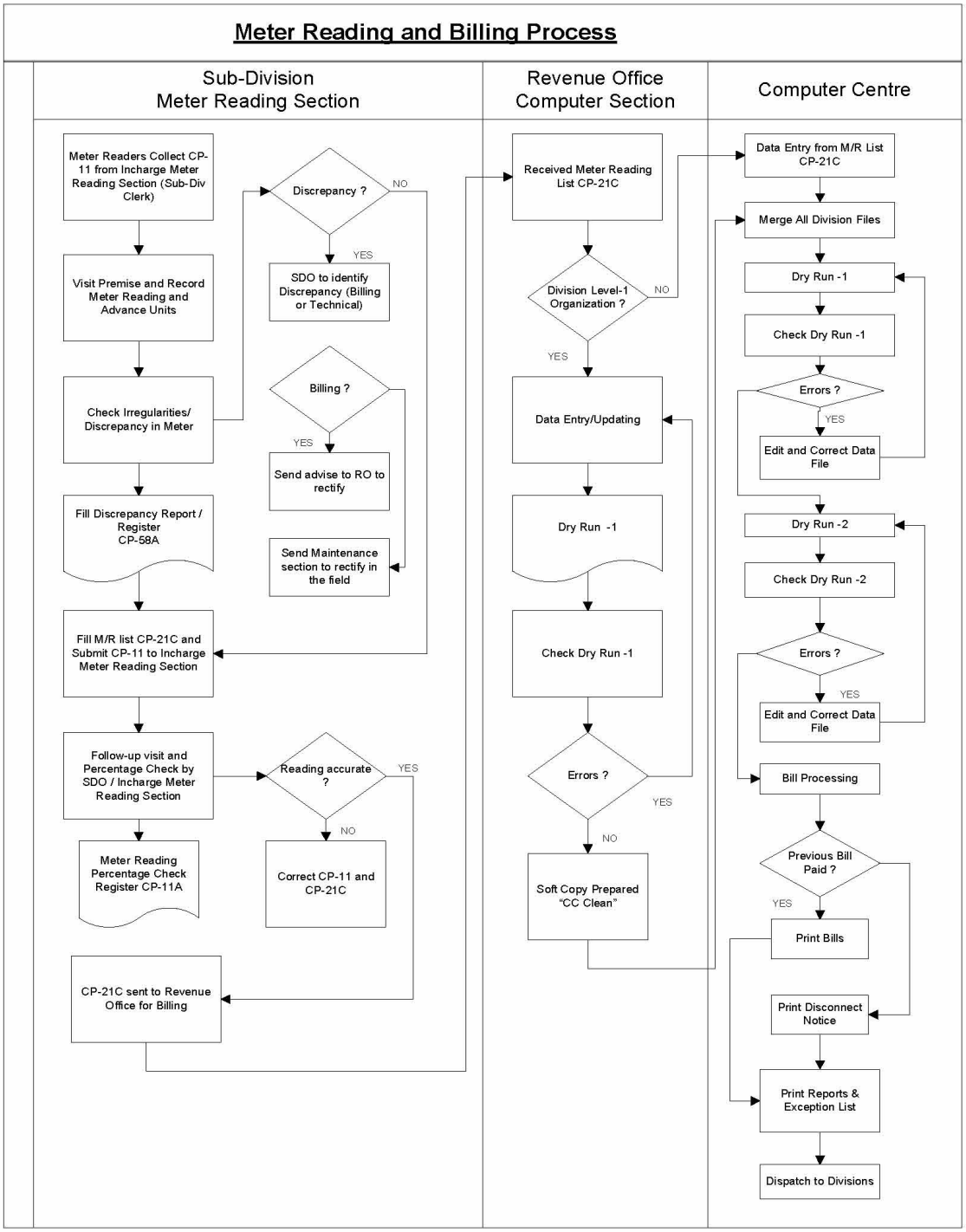
	Percentage of meters/consumers to audit						
Responsible Officer	**General**	**Industrial <40KW**	**Industrial > 40KW**	**Tubewells < 40KW**	**Tubewells > 40KW**	**Load >500KW**	**Unspecified**
Line Superintendent in charge	5%	15%		15%			
Meter Reading Section Supervisor	20 per week	15%		15%			
Sub Division Officer	5 meters per day	2%		2%			
Executive Engineer			10%		10%		2 meters per day
Superintending Engineer						15%	1 SDO audited meter, 1 XEN audited meter 3 meters each week

While these measures are part of commercial procedures designed and accepted by HESCO , interviews with HESCO commercial staff and record sampling indicate that in fact, there is little or no evidence that these procedures are actually followed. HESCO commercial management and employees indicate that there is insufficient time to perform the randomized evaluations of meter reading accuracy; and, review of meter reader event logs revealed that meter readers are not consistently identifying problems with meters.

Figure 2.2 below illustrates the meter reading, data processing, and billing processes as described by HESCO commercial staff, and verified by the PDIP team. As the diagram shows, the meter readers are

responsible for meter inspection to note if there are problems with the meter enclosure, signs of meter tampering, meter stoppage, or other problems. The diagram also shows that the Sub-Division Officer is also responsible for performing random checks of meter reading values – to verify if there are issues with particular meter readers. Thus, there are formal checks in place to detect meter inaccuracy, as well as to detect meter reading fraud.

Figure 2.2 Meter reading and billing cycle (general consumers) process diagram



With regard to the meter reading cycle, HESCO designs meter reading into a series of batches. Given that there are 20-23 working days per month; HESCO divides consumers into 21 batches for purposes of

meter reading, bill printing and delivery. This allows for continuous bill processing. The benchmark is for the bill to be given to the customer 10 days after the meter reading.

HESCO uses 20 batches to manage the meter reading and billing cycle for general consumers. These batches are read by the regular meter readers. The additional batch is for industrial, tube wells and other consumers equipped with demand meters which are read by the subdivision officer or the division executive engineer. This batch also contains a few domestic and commercial consumers; the inclusion may be an error or intentional additions to the batch.

The reading list for each batch is supposed to include consumers on the same feeder. However, this is not the always the case. HESCO commercial officers stated that exceptions are made where feeders intersect; it is more convenient for the reader to read the meters on adjacent feeders when the meter readers are already in close proximity to them. When possible, the size of the batch is based on the number of readers and the "yardstick" of 2,000 meter reads per month to evenly distribute the workload throughout the month. The batch for each subdivision is then divided by the number of readers to create the daily route size.

The billing center has the aim of printing meter reading lists (CP-21) 5-7 days prior to the scheduled meter reading date. The lists are delivered to the division office and then distributed to the subdivision offices. Because the lists are prepared so far in advance of the actual reading date, new connections may go unread for multiple months. The lists may reach the meter readers 3-5 days after the reading date. However, the readers do not use the reading list while reading the meters. Readings are recorded and consumption is first calculated in a "Kalamzu book" and then transferred to the reading list at the end of the day. The reader has a two or more years of the consumer's historical consumption in his book.

The reading lists contain the consumer number, his tariff code, the previous read and the consumption for the same month in the previous year. When transferring the current reading from the Kalamzu book to the meter reading list, the reader also calculates the consumption. If the consumption is out of line with the previous year's consumption, the current reading maybe adjusted. It was not uncommon to find cross-outs and overwrites on the reading list. The purpose of calculating the consumption is to prepare a check for the data entry of the readings. The process of meter reading and preparing the meter list may take 2-3 days.

The date of the meter reading used for billing purposes is the date scheduled for the meter reading. Readings may actually occur 2-3 days before to 2-3 days after this scheduled date.

Bill Preparation

The meter reading lists from each subdivision are passed to the division's revenue office. The transfer process usually requires another day or so. The revenue office enters the readings for all subdivisions under its control. Most revenue offices are managed by two data entry clerks and a supervisor who enter all consumer data for transfer to the computer center in addition to the readings. The clerks work in shifts in order to get all the data entered in a timely manner. Data entry for 6000 meter reads requires a full day for the revenue office team, so if one reader is behind schedule, the entire batch is delayed for the division and all other divisions served by the computer center. Once the data entry has been completed, the total consumption for the batch is compared to the sum of the subdivisions batches as determined by the reading lists. The data is then transferred to the billing computer center either by email or delivered to the center by flash drive.

Only 8 of the 25 divisions are Level 1 division and have the capabilities to prepare meter readings for electronic transfer. The remaining divisions send the paper meter reading lists to the computer center for data entry. Data entry of readings for all MDI consumers (consumers with demand indicators) is done at the computer center.

If closing for the previous month has not been completed, bill processing will be delayed. If all –meter reading lists with the same batch number have not been received from all divisions served by the center, bill processing may also be delayed. Not every division sends electronic data files and the data must be entered or digitized by the computer center. Therefore, it may take 9-10 days to process meter reading

data for a batch assuming there are no delays in receiving the raw data and data entry. Delays in the meter reading process are the primary cause of delays in bill processing.

The issue date on the bill is seldom the date that the bill is printed. For the month of November, the actual print (issue) date was 3 days behind the scheduled issue date. Allowing for 2-3 days for the bill to be delivered to the revenue office, then the subdivision office, and finally to the consumer, there is not sufficient time to for the customer 7 free days from the receipt of the bill to the due date as required by NEPRA. The due date of the bill should be calculated from the date the bill was printed with an allowance for delivery days.

Table 2.xx Comparison of Days from Bill Issue to Bill Due Date

COMPARISON OF DAYS FROM BILL ISSUE TO BILL DUE DATE					
	Minimum	Maximum	Average	Median	Most Frequent
Scheduled Issue date to Scheduled Due Date	8	21	11.8	11	14
Scheduled Print date to Actual Print Date	0	9	2.8	3	3
Actual Print Date to Scheduled Due Date	7	13	9	8	8

The billing program that is being used by HESCO was written in COBOL in the late 1960's. Since the code was originally written, revisions have been introduced to improve functionality for maintaining customer balances. Printing of bills and reports is done in SEQUEL. The database is designed exclusively for electricity billing activity; however the COBOL program will not allow HESCO to include other revenues and security deposits in the bill.

Although the computer center can store 12 months of history, this information is not available to the DISCO. Only the current month is available on the web which is the primary source of information used by the customer service centers. HESCO downloads the current month billing activity onto a separate SEQUEL server in order to maintain a more complete consumer history.

COBOL is designed for batch processing. This has greatly affected the procedures used by HESCO and the other DISCOS. Most transactions are posted when the meter readings are posted. The transactions may be entered as received, but they are not added to the consumer's account until the batch is processed. The batch is not processed until every division has submitted its data for that particular batch.

The billing program was first developed by WAPDA. WAPDA originally programmed controls to ensure the integrity of the program and the data it contained. The program is now controlled by the DISCOs and many of the controls are no longer in use. There has not been a transactional audit since the transfer.

There are 25 billing centers around the country. A DISCO may have 1 to 5 centers; HESCO has 4. Some customer service centers are connected to the system via the web so that duplicate bills can be produced. However, bill adjustments must be entered at the revenue offices. Consumer balances are updated only twice during the month—before printing the bill and at the end of the month for closing.

The bill should be reformatted. The current format is difficult for the consumer to determine if adjustments for previous months have been posted to his account, how the arrears (past due balance) amount was determined, or the amount on which taxes are calculated. For transparency, the bill should begin with the previous month's balance, and then show all transactions for the current period and then the balance that is now due. Once the bill is prepared and ready for delivery, the batch should be closed and all adjustments to the consumer balance should appear on the next bill.

Bill Delivery

The billing timeframe is very tight. Delays in any part of the billing cycle may result in late delivery of bills to the revenue office where the bills are sorted and delivered to each subdivision. The schedule assumes one day for delivery after receipt in the revenue office.

HESCO personnel are responsible for bill delivery. Bills are hand delivered to urban consumers. Because transportation is not provided, the bills for the rural areas are left at a single location, and the consumers are responsible for collecting bills from these pre-defined central locations. This introduces another source of risk to the bill delivery process. Sometimes the bill gets lost and the customer comes to a customer service center to get a duplicate bill.

Before the delivery process can be outsourced or use alternative delivery methods such as courier or the post office, the customer address must be updated. Employees reported that a large number of customer addresses are inaccurate and that the customer database cannot be relied upon.

Bill Adjustments

Bills can be adjusted if required at the customer service centers immediately. When bill delivery is not timely, consumers request an extension of one to three days. If a consumer makes a request for partial payment of a bill, some customer service center employees state that they may authorize installments of two to three payments, provided the amount is less than Rs. 20,000. The first installment must be greater than the current bill. A wrong reading can be adjusted immediately with no questions asked. These adjustments are not made according to policy, but are being written on the customer's bill. However final approval for the adjustment must be received from the SDO, XEN, or SE before entry into the billing system.

Due to the fact that meter readings are, on occasion, estimated rather than read, actual readings in subsequent months can have the result of pushing some consumers into a higher tariff block. The consumer's bill may be segregated into several periods to lower the total bill allowing the consumer to avoid the higher slab rates. Segregation usually requires the approval of the XEN.

Since complaints can be received from any division, the Customer Service center needs information from the concerned division to clear the complaint. After 7 days, the service center begins sending letters to the divisions requesting the resolution documentation. A review of the list sent on December 20 contained unresolved complaints from November.

Adjustment forms are prepared and sent by post to the concerned RO daily for adjustments made by the service center. The problem that may arise is the time required to deliver the adjustment to the consumer's revenue office and the time the adjustment is actually entered into the computer. The data entry for the adjustment is sent to the computer center in the same batch that contains the meter readings for the month. If there is a substantial time lag, the consumer may have to return to the billing center for another billing adjustment. In other words, the back office procedures do not follow through with actually adjusting the consumer records.

Bills may also be adjusted as the result of audit procedures. There are 17 revenue audit teams. They audit 100% of the industrial, tube wells, and commercial billings with maximum demand indicators (MDI) and all new connections. Each team needs 2 to 3 months to complete an audit. Since there are 25 offices, and 17 audit teams, each office is being audited about 6 months per year. There is no audit through the billing system or tracking of theft cases. All findings are reviewed by the revenue officer who has the discretion to dispute and eliminate or reduce the findings. The audit is basically a comparison of documents to the billing database; it is not normal to view the meter. Only under-billings are reported. There were 31 findings for November after the review of 80-85,000 bills. The total of the findings was Rs. 5,193,575.

For the FY2009-10, HESCO had 7,848,129 bill adjustments. Although the PEPCO report does not detail the adjustments by type, the majority of the adjustments was fuel price adjustments and affected only the amounts owed by the consumer. The 624,352 adjustments increasing the customers' bills for 710 million kWh (5,331.34 million Rs.) are assumed to be detection bills and corrections. There were 48,332 credit adjustments for 66.7 million kWh (607 million Rs) of which 12% occurred in June.

Payments

Payments to HESCO can be made at any commercial banks that have been authorized to collect, at local post offices, at NADRA kiosks, or electronically. As payments are received, the pay points prepare a scroll documenting the customer account and the amount paid. If the banks have online facilities, the customer information may be transferred electronically. However, posting of electronic payments is not done until the paper information has been received by the computer center. For those pay points without online facilities, scrolls and payment stubs are physically transferred to the revenue office. The revenue office reconciles the total of stubs and scroll entries; this process usually takes only one business day. If the bank forwards the scrolls and the payment stubs daily, it takes three days from the date the consumer makes his payment until it is received by the computer center. Personnel at the computer center will scan the payment stubs and reconcile the amounts to the scrolls.

Pay points will not accept payment amounts less than the amount indicated on the printed bill. If the bill has been adjusted by the utility, the billed amount is adjusted, with the adjustment written on the bill. However, since bills are bar coded, adjustments require manual intervention when scanning the stub for data entry. The actual due date is included in the bar code. While scanning at receipt, the computer will adjust the amount billed for the late penalty. If this does not agree with scroll, the scroll amount takes precedence.

The money, net of collection fees, is usually transferred to HESCO's collection account daily. The timing of fund transfer is dependent upon the agreement with HESCO and the pay points. HESCO closely tracks the receipts of scrolls and funds. If not received per the agreement, a letter is sent to the bank manager inquiring why the remittances were not received on time.

The daily postings to the consumer accounts are balanced with the bank scrolls (receipt logs) by the data entry personnel. If there are exceptions that cannot be cleared by rechecking the data with the source documents, the computer center will send inquiries to the revenue office. The RO will deal with the banks regarding the errors. Banks provide a weekly statement of amounts collected. The revenue office of the division will reconcile the statement with the office copies of the bank scroll transmittal documents.

Less than half of the assessments for the period ending October 2010 were collected. This is a continuing downward trend. For the FY 2009-2010, the collection rate was 59.8%: FY 2008-2009 was 68.2%. This trend cannot continue if HESCO is to be a viable entity.

Calculation of YTD Rate of Collection

Tariff Category	Jul 2010-Oct 2010		Collection
	Assessment	Collection	Rate
01 TOTAL DOMESTIC	9,495,920,576	3,535,599,262	37.2%
02 TOTAL COMMERCIAL	2,193,133,273	1,943,807,554	88.6%
03 TOTAL INDUSTRIAL	4,533,758,493	2,764,035,971	61.0%
04 TOTAL BULK SUPPLY	1,015,634,897	639,000,160	62.9%
06 TOTAL AGRI. T/WELL	2,707,296,329	639,093,358	23.6%
07 TOTAL PUBLIC LIGHT	733,586,741	5,537,096	0.8%
08 TOTAL RESI. COLONY	28,765,627	27,602,954	96.0%
GRAND TOTAL:-	20,708,095,936	9,555,469,821	46.1%

Source: Oct 2010 MIS-11B

Disconnection/Reconnection

The billing/collection program automatically prepares a list of delinquent consumers who are subject to disconnection through an Equipment Removal Order (ERO) for all consumers who have not paid their outstanding balances within the grace period. The list is reviewed and edited by the billing supervisor and the revenue officer. The revenue officer has the authority to selectively delete consumers from the list, and those EROs are cancelled. The actual disconnect list is manually prepared because of the time lag between the computer preparation and adjustments for payments received.

The list and the equipment orders to be executed and the cancelled orders are sent to the revenue officer. The orders are sent to the technical department to be executed. On a periodic basis, the revenue officer is required to review the status of equipment orders to ensure that services have been disconnected. When equipment orders are executed, HESCO technicians remove meters and services from the customer's premises, all of which are deposited and stored in the subdivision for one year.

If the consumer pays all amounts due within one year, the service and meter are re-installed. After one year the equipment is returned to the regional stores. Should the consumer pay his bill after one year but before three years have passed, the consumer may be reconnected, but the consumer is required to pay for a new service connection. The consumer is credited with the depreciated value of the equipment removed, but must pay for a new service and meter. After three years, the consumer is required to pay the current security deposit and the full equipment costs.

Frequently the disconnected consumer will reconnect himself rather than pay his arrears and reconnection fees. HESCO has chosen not to disconnect many consumers so as to keep them metered for system operation purposes. This practice also provides proof of consumption in anticipation of future recoveries. Consequently, some EROs have been outstanding for more than a year. One division reported having EROs outstanding in excess of 6 years. Consequently, without penalty (disconnection) for nonpayment the customer continues to use electricity without paying for it.

Equipment Removal Orders Outstanding 30Jun2010 (Rs in millions)

	EROs outstanding	Balance due at date of issue	Current balance due
Private customers	391,928	2,710	19,059
Government customers	18,698	4,864	29,105
Total	410,626	7,574	48,164

Source: PEPCO—DISCO Performance Statistics, June, 2010

There are reports that some consumers are very aggressive and have threatened utility workers as they tried to disconnect consumers. Without the support of civil authorities, it is difficult, if not impossible, to carry out any disconnection policy.

Accounts Receivable

Due to the lack of collection enforcement through disconnection HESCOs receivables have continued to grow. HESCO receivables have increased from 33,999.7 million Rs at the end of FY 2009 to 52,358.2 million Rs at the end of FY 2010. The FY 2010 balance comprises 32% of receivables for all eight of the public distribution companies.

Government receivables of 26904.6 Million RS represent 590 days billings: private receivables totaling 25452.6 are 317 days of billings. The total days of billings for the FY 2010 is 416 days which is the highest among the other DISCOs.

Customer Service

Consumers may lodge complaints at any of the Customer Service centers and at the subdivision offices. The complaints are registered in log books. There are separate registers for each type of complaint. Some customer service personnel reported that they have the authority to adjust consumer bills for wrong readings with no questions asked, to provide extensions up to 3 days and to provide up to 4 installments for bills less than 20,000 rupees.

Customer service personnel need to be made aware of the actual policies and procedures of HESCO. The procedures are not applied consistently. Some CSRs make adjustments with no verification from the field. Others will adjust the bill up to 500 KWh with no questions. Others require verification from the field for all adjustments.

The divisions have a customer service center that is open 7 hours per day. Although the centers have received sanction for a telephone operator; none has been hired. The 118 toll free number is not listed on the bill. The XEN and SDO numbers are listed on the bill. If the complaint requires an adjustment to the customer's bill, the change is entered onto the bill and the customer is free to go pay his bill. Most frequently entered as a bill complaint is the consumer's request for a duplicate bill.

The many complaints relate to supply failures. However, the record keeping methodology is such that is difficult to determine the number and cause of complaints. Various reports provide conflicting numbers.

Commercial Department Organization

The HESCO Chief Executive Officer (CEO) responds to the Board of Directors and is responsible for representing the company in the community. He manages all headquarter functions, and oversees field operations that are managed by Circle Superintendent Engineers (SEs). Divisions in turn are managed by Executive Engineers (XEN); and Sub-divisions are managed by Sub-Divisional Officers (SDO).

The Customer Services directorate is managed by Manager Commercial/Director Customer Services (CSD), who reports directly to the CEO; the Manager of MIS reports functionally to Manager of Customer Services, and administratively to CEO.

The Deputy Commercial Manager (DCM) is posted at circle level and reports functionally to CSD but administratively reports to the Superintendent Engineer (SE) of the circle. The Deputy Manager (MIS) is posted at the circle computer center, and reports functionally to Manager (MIS) but administratively reports to the SE of the circle.

The revenue officer posted in revenue office at division level reports functionally to circle DCM but administratively reports to the XEN of division.

The revenue office is headed by the revenue officer and is organized in 4 main sections as follows:

- Accounts Section: Headed by the Divisional accountant responsible for managing the cash book, reconciliation of weekly bank statement with the cash book, reconciliation of the debtors control accounts. The divisional accountant also has responsibility for accounting matters under procedures laid down in the divisional accountant Manual.

- General Section: Headed by commercial Superintendent responsible for receiving duplicate copies of certain specified application forms and other connection documents from the sub-divisional Offices, maintaining connection application registers and files for each consumer.

- Billing Control Section: Responsible for controlling meter reading and data delivery to computer center; ensuring that billing is correct; making adjustments to inaccurate or incorrect bills; issuing disconnection notices, preparing certain management reports and statistics, bill dispatch.

- Debtor's Control Section: Responsible for controlling the computer prepared debtors' ledger, balancing ledgers, carrying out debt recovery action, debtors' control reports and statistics.

The following section summarizes a review of the value of changes to HESCO commercial practices:

Analysis of Changes in Revenue Cycle Practices

During the month of November, Rs. 2,379 million were collected. If the collection period were reduced by just 10 days by streamlining the billing cycle, Rs. 6.5 Million could be generated assuming an annual interest rate of 10%. Potential savings accrued from improved meter readings are yet more substantial, and, as would be if there were a better mechanism matching new connections with an increase in customers billed. Consumers are not billed when the billing center fails to receive notice that a consumer has been connected or reconnected. In many cases, the consumer is billed after a period of delays, and the utility makes concessions by allowing installments or even forgiving a portion of the bill.

The revenue system could work more effectively if the practices and procedures were followed with greater discipline. However, it is the undocumented transactions (aka administrative losses) that are worrisome. The calculation of technical losses and energy accounting would allow a better reconciliation

of deliveries and amounts billed. Comparing losses of the current period to prior periods is not an accounting of energy. It just perpetuates the previous error.

Because there is much reliance on the meter reader in the revenue cycle, more rigorous controls and oversight are required of the meter reading cycle. It is impossible to assert effective transaction control if there is collusion between the meter reader and other parties in the revenue cycle. Although there are procedures in place that would provide some of the needed oversight, the procedures are not adequately observed nor performed in a timely manner. HESCO does few meter reading checks and has little political will to end theft. Manipulation can occur while preparing the reading lists used for billing purposes. The preparation of meter reading lists can be eliminated altogether through a change in technology – or by a combination of changes such as automated meter reading with handheld devices.

Distribution losses may be hidden by adjusting consumption of selected meter reading upwards. The addition of consumption to various consumers can be used to manipulate revenue and allow managers to meet performance targets. Some of this manipulation may be uncovered during data entry, but is frequently ignored. But with the addition of automated meter reading, the data is uploaded to the billing program eliminating the need to manually enter the data and reducing the opportunities for manipulation.

Meter lists and routes are not defined for individual feeders, which complicates energy accounting. Losses are incorrectly calculated for feeders. The deliveries are calculated on the calendar month. Billed amounts are based on the billings for the same calendar month, but the consumption has occurred over a two month period due to the staggered billing cycles. Although deliveries and recoveries are 30 days each, they are not the same 30 days so the losses can fluctuate with the changing seasons.

Meter routes should be organized around metered transformers and all of those meters should be read on the same day. A reconciliation of energy needs to be made to for each transformer to determine the reasonableness of the energy billed. If it is not reasonable, there may be theft, meters were missed or recorded incorrectly, or there may be a problem with the system.

To prevent newly connected/reconnected meters going unbilled for several periods, logs of prepared service orders and status must be kept and reported. Service orders should be in duplicate and copies should be sent to the revenue office, which should be responsible to follow up when the order has not been cleared within a reasonable time. When the service connection order is prepared, the consumer should be established and entered into the meter reading list and the reader's Kalamzu book. The reader should track the progress of the installation while reading meters and would be in the position to note the meter number and the current reading during the first cycle that the consumer is connected. The consumer's billing data can be pre-listed and the consumer will be ready to be billed once the connection is completed.

If the customer can be given a reasonable level of service, he may not find it necessary to arrange his electricity through nefarious means. HESCO will have better control of its system, dangerous situations may be eliminated, and satisfied consumers are more likely to pay their bills regardless of the "outlandish" tariff rates.

Meter Management

Meter surveillance is done by the M&T (metering and testing) teams, but the primary responsibility rests with the meter reader. Industrial meters are checked by an M&T team every six months. The testing procedure is performed in the presence of the industrial consumer. Other meters will be tested if a consumer requests a test or the utility employee reports an abnormality in consumption or there appears to be physical damage. If the meter slows gradually with age, it will very likely go undetected. Moreover, many meters are located on poles or high on the outside walls of the premises, the meters are above eye level and frequently obscured by the service drops. It is doubtful that those meters are actually read and any damage or abnormality would go unnoticed.

Taking into consideration field observations of meter reader management, location of meters, and the state of many of the meters, it is doubtful that all meters are read and inspected each month. In theory, meter readers should inspect the meters during the reading process and report any abnormalities and

damage to the meter each month. However, there was scant evidence of meter status reports in HESCO revenue offices.

When a meter is reported as defective it should be replaced immediately. Most meter replacements have been for reasons other than defective replacements. In the FY2009-2010 52232 single phase meters were replaced, but only 11859 of those replacements were for defective meters. Almost five thousand three phase meters replaced but only 13% were for defective meters. At the end of June 2010 almost 35,000 defective meters were still in service; more than 40% have been declared defective for more than three years.

HESCO has a shortage of meters; only 20,000 single phase PC meters are in stock. There were no three phase meters listed on the PEPCO stock balance report for June 2010. Because of the shortage, preference should be given to the replacement of defective meters.

Preference can be given only if the meter is declared defective. The meter discrepancy report, log of defective meters, is updated by the meter reader; defective meter logs may not be kept in some subdivisions.

Meter serials numbers not routinely recorded when new meters are received from the manufacturer. Meters are "managed" at the sub-division level. When meters are installed, the serial number is recorded in the Kalamzu book, and in the consumer's computer file. There are no records detailing the location of a specific meter and its inspection / maintenance history.

Advanced Metering

To improve the billing process, automated meter reading should be installed not only on the premises but also at delivery points. AMRs will eliminate transcription errors and reading errors; manipulation of readings on behalf of consumers or management. The data can be loaded directly into the computer system. AMR meters result in real time consumption data provided directly to the utility commercial system. Consumer usage can be monitored from a remote point of access (such as the commercial office).

Pre-payment meters may be used to allow consumers to purchase energy before using it. The basic principle of the pre-payment system is that customers estimate how much energy they require before they consume it, and buy payment tokens (electronic or hard copy) beforehand from a vendor. The pre-payment meter is then credited with the value of purchased credit. After the pre-paid credit has been consumed, the meter automatically disconnects until additional credit is purchased and programmed into the meter. While there are advantages to the consumer (no more over billing, control of the amount and timing of payment, ability to monitor consumption, etc.), these advantages will have to be communicated to consumers to sell the program to them. The advantage to the utility is that the prepaid meter disconnects itself if not replenished. If the meter has communication with the utility, it can be monitored for unreasonable periods of non-replenishment.

Meter Reading and Bill Delivery Practices

Although the meter reading "yardstick" is less than 200 meter reads per day, many meters may go unread. The average subdivision contains over 10,616 consumers. The largest subdivision had 24,631 consumers. Readers are required to provide their own transportation without reimbursement. The result is that many readings may be estimated or simply falsified. This is a serious problem for the DISCO and for the consumer.

HESCO declares that meter readers are being rotated. Some subdivisions rotate readers on a quarterly basis; others every six months. Rotations may be in form only, as readers may exchange reading lists once out of the office. Trade unions monopolize areas allowing employees to retain designated routes within specific subdivisions. This leads to a lack of objective meter reader control that, in other countries, has resulted in developing and sustaining personal income streams through fraudulent meter reading practices. In cases where meter readers are not rotated or constricted by trade union representatives, this has led to a lack of transparency, accountability and the required level of checks and balances that is needed for program integrity.

In one division, the team reviewed a worksheet prepared by the RO for the month detailing the revenue targets. The worksheet took into account the targeted units for the feeders, the meter readings completed to date, the number of readings remaining, and the units required to the meet the target. The SDOs are informed of the units required to meet that revenue targets by adjusting meter readings.
Bill distribution is performed in the urban areas on a house by house basis, while in the rural areas bills are left at a central location. Since bill delivery requires that the employee provide his own transportation, this leads to less than adequate delivery practices in many cases. This problem leads to delayed delivery wherein consumers receive bills with a shortened period to complete the payment process. Because the bill preparation process is often delayed, the delivery of bills is delayed.

Theft Control

With a less than ideal meter reader rotation, opportunities for collusion with the consumers are numerous. Practices that can result from collusion include falsifying meter readings (recording low or high consumption as needed), and/or declaring the meter defective, so that estimated bills would be lower than the actual consumption. Because the time required to replace the defective meters is lengthy, invalid meter readings could continue for some months. Collusion could also result in reporting lower consumption levels to ensure that the consumer is billed at the lower slab rates.

There are numerous checks prescribed in the NEPRA guidelines, and adopted by the DISCOs, to audit meter readings, but field reports indicate that these procedures are not followed. XENs and SDOs claim they are too busy to make time for meter reading audit procedures.

Meter readings submitted for billing purposes are reportedly influenced by the management of the divisions and subdivisions in order to meet revenue and loss targets. Some consumers are overcharged to compensate for the under billed consumers and losses due to theft. Readings are frequently adjusted to manipulate the slab tariffs to create revenues. Over a period of a few months, the actual meter readings will be correct, but the consumer has been charged at the higher rates which are not fully compensated when the consumption is lowered.

The lack of meters and other equipments lead to many consumers directly connecting to the system. The ease in which customers can reconnect has made the disconnection a worthless endeavor. The law and order situation hampers the disconnection process. Without support of the civil authorities, HESCO files very few FIRS; only 11 FIRS were lodged in FY 2009-2010.

Meter Integrity

When a meter is declared to be defective, the consumer is billed on the average consumption of the last 11 months. Because it is the meter reader that declares a meter defective, there is possibility of collusion between the reader and the consumer, especially during the peak season of summer. Therefore, the reader declares the meter defective and the consumer is billed on the lower estimated consumption. Since it takes 3-4 months for the meter to be replaced, the air conditioning season is over before the consumer is billed on actual consumption.

With meters located 7-10 feet above the ground, it is difficult to detect meter tampering. The quality of service installations is problematic; many of the meters are poorly installed. Employees sometimes have to use the tools and small parts (screws, etc.) furnished by the customer. The meters may be loose, crooked, etc. and so it would be difficult to state that someone has tampered with the meter.

The slow response of HESCO to reports of defective meters leads to large numbers of bill adjustments or detection bills. For the period ending February, 2011 almost 16% of the units billed were adjustments.

UNIT RECEIPT,BILLED AND ADJUSTED -- HESCO FROM 07/2010 to 02/2011						
MONTH	T & D Units Received	Total Units Receipt	Total Units Billed	Total Units Adjusted	Net Units Billed	% Adjust
	1	2	3	4	5=3+4	6=(4/5) *100
Jul-10	885,517,000	817,882,621	447,264,727	90,032,180	537,296,907	16.76
Aug-10	895,830,000	829,627,533	444,975,028	89,046,549	534,021,577	16.67
Sep-10	869,860,000	887,077,198	463,545,242	94,463,135	558,008,377	16.93
Oct-10	785,052,000	733,100,972	431,052,772	82,486,854	513,539,626	16.06
Nov-10	645,041,000	667,762,248	434,443,376	72,674,440	507,117,816	14.33
Dec-10	565,132,000	536,416,597	370,339,222	54,582,885	424,922,107	12.85
Jan-11	528,388,000	505,011,080	324,316,057	60,556,317	384,872,374	15.73
Feb-11	490,151,000	523,111,435	336,853,309	57,897,138	394,750,447	14.67
TOTAL	5,664,971,000	5,499,989,684	3,252,789,733	601,739,498	3,854,529,231	15.61
Source: CP-22						

Customer Information System

Presently, HESCO distribution system practices are characterized by manual and cumbersome processes, inadequate controls, insufficient commercial focus, limited transparency and lack of reliable information. As a result, commercial operations are highly inefficient with substantial revenue leakages and poor customer orientation. The use of information technology to improve efficiency and effectiveness is inadequate. Several stand alone applications are limiting the ability to effectively interface and integrate either with other applications or with potential applications to be deployed in the future. Although the level of deployment of IT varies significantly from one DISCO to another, the key applications have been in multilevel aggregation of data or large-scale data processing. In other words, IT is being used as a tool to address a specific issue or two at a time and not as a long-term, holistic strategy.

The following are some examples of inefficiencies:

- A number of new connections are pending even after paying the capital cost and security amount because there is no material available in store. Availability of service materials is not confirmed prior to issuing the Demand Notice. An integrated materials management and work order module would allow HESCO to order materials when needed, and connect consumers on a timelier basis.
- HESCO does not have digital records of paid demand notices.
- Applications for new connections are managed manually (a number of hands and desks are involved), without any level of automation.
- Late submission of consumer consumption data to the computer center for billing new connection results in delayed billings and revenue recovery.
- The commercial processes are reasonably well designed, but the lack of electronic technology creates significant delays, and moreover, opens tremendous vulnerabilities that can be relatively easily exploited.
- The customer services activities are not automated. One significant problem lies in the fact that the customer account records cannot be updated in real time, i.e. customer bill is revised manually, but in many cases, the same amount appears as an arrear in the next month's bill.
- Delayed billing due to non distributed billing/data processing system increases bill processing and bill collection cycles, i.e. computer center waits for data of all sub-divisions of all divisions of 4 circles before processing.

- Only one month's billing information is available on the computer's master file, historical data is off-line, i.e., in tape cartridges. Thus no trend analysis/drilling to find the gray area of business could be performed.
- Delayed cash processing/posting (more than 10 days in some cases) delays the cash reconciliation process. Also management gets information very late.
- Delay by banks in remitting money to company's account due to cash collection policy.
- No historical computerized record of service complaints.
- No computerized system for transmission loss calculation.
- Field staff is engaged in a number of duplicate activities, i.e. maintenance of documents/registers at many levels, copying information from one form/register to another form/register, etc.
- Unwillingness/non cooperation by non-IT users to use new technologies is a key hindrance towards improvement in customer/utility relationship.

2.5 HUMAN RESOURCE ASSESSMENT

2.5.1 Overview

Management and staff interviews held at HESCO have led to the conclusion that, while HESCO appears to have made significant progress in retailing electric power to its customers, it still faces significant challenges to modernize its HR policies, procedures, and overall HR functionality. It has yet to develop a strong and progressive corporate culture, in which management and staff have well-defined and clearly laid out responsibilities, where management is endowed with adequate authority and have accepted and understood their accountability. For all intents and purposes, HESCO today employs a very close facsimile of the WAPDA legacy HR policies and procedures; it does not reflect the values and attributes of a modern, independent, and well-managed electric distribution utility. Results of the interview process showed that the management is not clear whether it reports to the Board of Directors, to PEPCO, or to the Ministry of Water and Power. Partly because of this, governmental (external) as well as internal political pressures are commonly and effectively exerted on HESCO's senior management – which is itself selected by PEPCO, not by the Board of Directors.

2.5.2 Summary of Key Findings

The following are key findings of the PDIP review of human resources management.

- The challenges facing the human resource infrastructure are serious and entrenched, because DISCOs have been subject to both internal and external manipulation – by political sponsors, government agencies, trade unions, and by employees themselves.
- HESCO has yet to develop a strong and progressive corporate culture, in which management and staff have well-defined and clear responsibilities, and where management is endowed with adequate authority and all employees have accepted and understand their accountability.
- Results of the interview process indicate that management is unclear as to whether it reports to the Board of Directors, to PEPCO, or to the MWP. Partly because of this, outside governmental as well as political pressures are commonly and effectively exerted on HESCO's senior management – which is itself selected by PEPCO, not by the Board of Directors.
- There is a lack of transparency in hiring and career advancement within the Company. Clear and transparent HR-related rules and regulations are lacking, without the necessary checks and balances in the system to foster an atmosphere of fairness and impartiality with respect to the annual performance review process.
- The compensation system makes no distinction between "performers" and "non-performers" nor does the system reward high risk jobs, such as linemen.

- DISCO salaries, including HESCO's, are artificially low as an result of continued adherence to WAPDA salary scales, but while this may result in savings to DISCO operating cost, this is in fact artificial savings; one cannot expect employees who are perennially underpaid to function at high levels of performance. In other countries, low compensation levels have been linked not only to poor performance, but also with tendencies to engage in corrupt work practices.

- The PDIP review revealed that HESCO has not yet drafted updated job descriptions for senior management and key staff positions. Rather, the position descriptions for senior management remain those of the Area Electricity Board. These documents lack clear and specific descriptions of roles and responsibilities; required educational background and professional experience; core competencies; and of the scope of authority and responsibility.

- While HESCO provides capacity and safety training at a central training center, the linemen trainees are trained with tools that are not commonly provided to line workers. The line workers are, in general, not provided basic line tools and equipment required to perform corrective maintenance and line operations in a safe and effective fashion.

- Health coverage for employees and their dependents is poorly structured and imposes considerable hardships on employees.

- HESCO's senior management has a vision, but the vision has not been effectively communicated to mid-level management and staff. It is therefore not well understood by employees.

- Recruitment of talented staff is hampered by the lack of effective position descriptions, comparatively low wage scales, and willful interference in hiring decisions.

- HESCO does not employ a corporate performance management system. Instead it uses the standard GOP annual performance review program that is not based upon goal setting and objective evaluation of performance.

- HESCO has not yet developed an Employee Handbook.

- The Company does not have a comprehensive training and development action plan and generally lacks training or capacity building programs. Training that is offered is mostly aimed at allowing employees to advance within the DISCO system, as opposed to skill development. Training facilities are ill-equipped, with instructors who have themselves not been retrained in many years, and with training manuals that have not been updated in two decades or more. The training program also lacks post-training impact evaluation to judge effectiveness.

2.5.3 Analysis & Discussion

Typical WAPDA hiring and promotion processes are being practiced in HESCO, as they do in all other DISCOs. That is why there is a lack of transparency in hiring and career advancement process. The career advancement is based upon seniority rather than performance and hiring often dictated by external agencies such as the Ministry of Water and Power and PEPCO. Clear and transparent HR-related and other rules and regulations have not yet been established, nor have the necessary checks and balances been put in place required for fostering an atmosphere of fairness and impartiality with respect to the annual performance review process. HESCO's corporate culture has not evolved to reflect a modern, independent electric distribution utility. Employees appear to be locked in a historic WAPDA or public sector mindset, where once employed, an employee continues to be employed and even gets promoted based on seniority, with scant regard to performance.

As in other DISCOs, HESCO faces the challenges of commercializing energy distribution over large areas, managing capital resources to finance system expansion and maintenance, upgrading its billing and receipts structure, etc. This requires professional HR, management, technical and a variety of other skills and experience.

In the past two to three decades, where there has been substantial expansion in the system, there has been little change in the internal infrastructure, policies and procedures. The organizational structure of

HESCO is inherited from the WAPDA regime, with little regard to alignment with the changed business, engineering and financial environment.

HESCO lacks a clear, proactive and structured training and capacity building program. This shortcoming needs to be addressed on a priority basis. Moreover, the company has not yet engendered a customer oriented approach to build trust and confidence in its customers.

Modern HR Practices

HESCO staff at all levels stressed the need for fair and transparent HR practices. The need is for an HR management system that is based upon accurate and up-to-date job descriptions, key performance indicators, and fair and rigorous appraisals. This is necessary to establish the foundation of a progressive business entity. According to our assessment, the absence of a proper HR management system is the root cause of problems at HESCO. Corrective actions need to be taken in this area and other areas like commercial, engineering and financial in order to get the desired results.

HESCO has job descriptions for all positions, however these are old and out-dated and there is a need for a comprehensive review and modification process in order to incorporate main job functions, responsibilities and performance indicators.

A modern HR system, complete with newly defined policies and procedures, would include the following attributes and characteristics:

1. Position descriptions, clearly indicating the main job functions, key responsibilities, performance indicators, educational requirements and training certifications for all positions in the Company.
2. A fair and transparent hiring process that allows the HR department to recruit staff in an objective manner, without any external or internal influence and interference.
3. A merit based career and progression structure and policy which defines the prerequisites for promotion, and which should be applicable to all positions.
4. A progressive and competitive compensation and benefits package, independent of government compensation levels, and adjusted to reflect market rates for all professional and skilled positions.
5. A newly defined health policy that provides increased flexibility to employees, allowing them to seek and receive health care beyond the WAPDA-centric health facilities.

Analysis of Manpower

Long-term performance improvement will require significant changes in human resource management, and human resource capabilities. A review of manpower human resource statistics was undertaken to begin to understand how resources are allocated, and how well-prepared HESCO employees are to meet the requirements of their positions.

Table 2.12 below summarizes HESCO manpower statistics, which shows that HESCO has only 29% of its staff having a university degree; less than 1% has any management or business training or experience; and less than 1% are females. A quarter of the workforce is virtually illiterate; of the 507 officers (SDOs and above), only 75 have some business or management experience. With long term planning, the company should aim for a qualified workforce, with higher emphasis on business and management skills, particularly in its senior staff.

A detailed study will be necessary to carry out long term manpower planning, with the objectives of having qualified workforce with gender balance

TABLE 2.12 MANPOWER STATISTICS	
Manpower Distribution	**Strength**
TOTAL	**16091***
Total Officers	507
Total Officials	15584
Regular Employees	14297
Contractual Employees	1652
Daily wages Employees	142
University graduates	4680
Secondary education	7530
Primary & complimentary	2571
Others	1310
Female	151
Male	15940

Source: HESCO HR Department Data as of January 15th, 2011.
* Updated information with reference to PEPCO DISCO Performance Statistics, June 30th, 2010, due to manpower sizing, attrition etc.

Table 2.13 shows that a large number – approximately 76% are categorized in the Operations Department. It is surprising that the bulk of overstaffing at HESCO is in the Operations Department as opposed to the practice in other DISCOs where this is done in the 'Others' category; HESCO only has 570 employees in the 'Others' category which is less than 3.5% of its total workforce.

TABLE 2.13 DISTRIBUTION OF EMPLOYEES BY DEPARTMENT	
Employees by Department	**Strength**
Executives/Directors	42
Finance Department	322
Operations Department	12,330
Commercial & Sales Department	920
HR Department	75
Admin Department	204
IT/ MIS Department	159
Construction Department	709
Training Department	35
Audit Department	112
Security Department	606
Others (Store, School, Civil, Other)	570
Total	**16091**

Source: HESCO HR Department Data as of January 15th, 2011.
* Updated information with reference to PEPCO DISCO Performance Statistics, June 30th, 2010, due to manpower sizing, attrition etc.

Table 2.14 below provides a snap-shot of HESCO employees' time in service. This shows that more than 70% of the employees have been in service for more than 11 years. This shows that a significant number of HESCO employees have been in the legacy WAPDA organization for many years, and that the

challenge of changing the corporate culture will be significant. The demographic distribution shows that a reduction strategy based on attrition through retirement could be reasonably effective; approximately 20% of HESCO's workforce will retire within the next 10 years, and 67% within the next 15 years. Any future activity on optimizing HESCO's manpower requirements should focus on this aspect, and review the distribution of this aging workforce in detail.

TABLE 2.14 DISTRIBUTION OF EMPLOYEES BY YEARS OF SERVICE AND AGE BRACKET

Year Of Service	Strength	Age bracket (Years)	Strength
0-5 years	1819	30 and below	800
5-10 years	2998	30-40	2201
10-20 years	2503	40-45 Years	2306
Over 20 years	8771	45-50 years	7503
		Over 50 years	3281
Total	**16091**	**Total**	**16091**

Source: HESCO HR Department "Data as of Jan 15th, 2011"

Compensation Analysis

A detailed market survey will be required to evaluate market-competitive levels of compensation for HESCO employees. The data showed in table 2.13 indicates that salaries and benefits HESCO employees are far below market standards.

DISCO regular employees are compensated through legacy WAPDA "basic pay scales" (BPS), a standard compensation package of the Government of Pakistan. Salary-related benefits, such as allowances, bonuses and increments are also treated under the same system. Under the system, there is no distinction between "performers" and "non-performers". The system does not reward high performers, or jobs with high risk, such as linemen, who prefer to move to other positions or ask for early retirement.

An exception may occur when an employee is hired as a "contract employee" - occasionally hired as DISCO Directors e.g., Director HR, Legal and Finance. The pay package for contract employees is considerably higher than formal HESCO employees and is not constrained by the Government Basic Pay Scales. The Director HR was hired on this basis and draws a salary that is considerably higher than the salary paid to the CEO.

Private sector employees are paid several times more than HESCO employees, and an even more striking comparison is that, a newly graduated engineer who is hired in the private sector would draw a salary equivalent to that of the CEO.

To arrive at a more definitive answer to the question of desired compensation package in a private sector entity, there will be a need for a market-based survey, with a much broader scope, and presumably carried out by a professional HR firm. However, such a compensation and benefits package will be possible only when the Company is freed from the Government's control, and financially viable

TABLE 2.13. COMPARISON OF HESCO AND OTHER INSTITUTIONAL SALARY LEVELS.

DISCO		NEPRA		NESPAK		PTCL		Level
	Rs'000		Rs'000		Rs'000		Rs'000	
CEO	132	Chairman	382	CEO		President		CEO
Director / Chief Engineer	109	Director General	338	Executive VP	278	Executive VP	425	Director
Manager / Superintend Engineer	87	Director	265	General Manager	217	General Manager	287	Manager
Deputy Manager / Executive Manager	69	Deputy Director	203	Principal Engineer	114	Senior Manager	170	Assistant Manager
Assistant Manager / Sub Div Manager	58	Assistant Director	140	Junior Engineer	84	Assistant Manager	90	Executive

Source: NEPRA Accounts Department, PTCL & NESPAK HR Department as of December 30th, 2010.

Organization

The organizational structure employed by HESCO and other DISCOs is designed to employ distribution circles as large geographic management units that are managed as full service utilities – less engineering planning. Circles are managed by Superintending Engineers who are empowered with the responsibility to manage all operational activities except planning and engineering functions, which are managed at the HESCO HQ level. That is, commercial functions (meter reading, bill processing, and bill delivery); line operations, connections and disconnections are all supervised by the Superintending Engineer and his staff at the circle, division and sub-division levels. Payments are made by consumers to designated pay points; DISCO employees do not handle payments from consumers.

This arrangement creates an internal conflict within the distribution circle; since commercial operations are the cash register, so to speak, of any utility, the commercial department should not report to the operations department. The operations department manages the operation and maintenance of physical assets, focusing on power quality and reliability. The commercial operations measure the success of the operations department and therefore must be independent and are best managed by managers and staff that have the educational and experiential background, as well as the institutional objectives aimed at optimizing distinct objective functions. Commercial activities have the objective of effectively managing the process of connecting and/or disconnecting services; metering energy consumption; recording consumption data; billing consumers for energy consumed and other services provided; and, collecting receivables from consumers. Distribution system operations focus on operating and maintaining the distribution system infrastructure, including recording bulk energy transfers into and out of substations; performing substation and line maintenance; and, management of minor system expansion activities.

HESCO's present organizational hierarchy has commercial personnel reporting to engineering managers; circle managers reporting to the CEO; and far too many managers reporting to the CEO. The CEO, whose principal responsibility is to ensure that the DISCO is moving towards progressively effective and sustainable operations, should not be saddled with administrative responsibilities that creates a distraction from the main goals of the DISCO—financial sustainability.

Human Resources Organization and Management

In addition to functional challenges, the human resource department is faced with organizational issues. The HR Director has a dual responsibility to oversee human resource activities, as well as act as Company Secretary, which is an administrative position that reports to the Board of Directors.

The Manager, Labor & Litigation currently reports to the Director, HR/Administration, while the legal counsel should report directly to the CEO. In fact, it is proposed that this function should be up-graded to Legal & Corporate Affairs. Even though on paper the Principal Regional Training Center (RTC) is reporting to Director HR, but in reality he was found to be reporting to Director Technical.

All HR functions are currently managed in the HESCO home office; there are no HR representatives at the circle level of HESCO. HESCO relies upon administrative staff to manage human resource issues at the circle level, but these employees have no training or expertise to conduct human resource training activities or to advise employees on their rights and obligations to the company.

HESCO has not yet established a human resource information system that would allow them to digitize all HR data, reports, personnel files, performance management programs, etc. This has become an essential feature of modern human resource management functions.

Health and Safety

The records of the previous two years show that HESCO has a poor record of safety in its operations. This is attributed to a lack of implementation of safety procedures and unavailability of safety clothing and equipment. The records of the previous two years (table 2.14) show that HESCO has had30 fatal accidents in the past 2 years. It is encouraging to see that the number of fatalities have gone down on a yearly basis over the past 2 years but there is still need for improvement.

However, HESCO has a very high number of fatal accidents met by the public were 75 casualties in the past 2 years. The high number of accidents met by the public are explained by HESCO as accidents occurring during unauthorized hooking to the LT lines by outsiders, who either do this by themselves or in collusion with the utility linemen staff.

Safety training does not meet the needs of line workers as evidenced by the high number of injuries and accidents in recent years at HESCO. HESCO has not developed a safety program with safety policies and procedures that govern linemen working conditions provide ongoing training, an incident reporting system to record and evaluate all workplace injuries, and enforcement practices and procedures for safety in line construction, maintenance, and system operations.

Safety is not given is due importance with respect to neither HESCO employees nor its consumers. Safety training to advise consumers on the proper use of electric power – and the risks involved in inappropriate contact with power systems – has not been adequately addressed. HESCO has not yet sufficiently developed and deployed safety awareness programs.

A safety program will require a significant investment in training, protective clothing, tools, and program monitoring. It will require a cultural shift in the workplace, all aimed at dramatically reducing accidents and deaths. In addition, HESCO employees would benefit from a diversification of health care options, moving away from the WAPDA health facilities as the primary provider of services, to increased options to provide primary care for employees and family members.

The health coverage for the employees and dependents is poorly structured and involves considerable difficulties for employees. There is a lack of choice for employees or their dependents to obtain medical care (out-patient and in-hospital) of their choice. Employees and dependents are forced to use the WAPDA central hospital in Hyderabad or a peripheral health care center, requiring considerable travel, or which do not possess the facility or required services. Alternatives, such as better health care through insurance, or paying a fixed proportion of salary for outdoor treatment, have not been evaluated or brought up for serious consideration.

TABLE 2.16 HESCO ACCIDENT RATE OF LAST 2 YEARS

	HESCO Employees		Public (Men)	
Year	Fatal	Non Fatal	Fatal	Non Fatal

2009-2010	11	18	38	5
2008-2009	19	18	37	5

Source: PEPCO Disco Performance Statistics June 2010.

Vision and Internal Communications

HESCO's senior management has a vision, however it is neither well communicated nor understood by employees at the lower level. The HESCO organizational structure should include management units with clearly defined objectives and linkages, each serving the goals of the Company, contributing to its growth, and the plans in order to make this into an autonomous entity. In particular, a Health and Safety directorate needs to be established, with higher levels of responsibilities; the Company Secretary's office should be separate and not under HR; it could also be entrusted to handle corporate and legal affairs; the training and staff development should be upgraded with clear lines of duties and responsibilities, aligning staff training needs with those of the Company. It will also be useful to establish a strategy and business and manpower planning unit, to look into medium and long term plans and anticipated changes, aligning the Company progression into an autonomous utility entity.

Recruitment

Effective recruitment begins with well-defined position descriptions specifying core competencies, experience, level of responsibility and authority, and compensation levels. Once these attributes are defined, the human resource department can advertise for candidates to fill vacancies both within and outside of the Company.

As mentioned above, the position descriptions even for the most important jobs in HESCO are not well defined, do not specify core competencies, required educational background or level of responsibility. The position descriptions are too general to be used effectively to guide the recruitment process.

Lastly, the recruitment process itself is often short-circuited by direct appointments made by PEPCO and/or the Ministry of Water and Power. This practice violates the concept of an independent electric distribution utility, and forces HESCO and other DISCOs to absorb professionals into positions for which they are likely not well suited. A more objective, independent, and transparent process is required to support operational improvement and DISCO independence in the future.

The policy of reserving 30% of published vacancies for employees' dependents has a direct negative impact on the type and quality of candidates that are selected. In 2009-2010, 238 or 23% out of a total 1,042 new recruits were based on this quota. On the remaining 804 positions, it was found that a thorough recruitment process spanning extensive job interviews, written tests, etc. wasn't followed. It is imperative that fair and transparent policies and procedures are adopted to put a curb on both these menaces. "This data was acquired from the HR Department as of Jan 15th, 2010"

Performance Management System

HESCO does not employ a corporate performance management system. In 2009, HESCO changed the annual evaluation system from the ACRs – Annual Confidential Reports - to Performance Evaluation Reports (PERs). The ACRs were confidential, in that even the rated employee was not privy to evaluation. The PER, which is essentially the standard annual performance review program proposed by PEPCO, uses a different format, but essentially has the same weaknesses. The PER lacks goal setting and objective evaluation of performance. The evaluation, unless it is a negative one, is seldom shared with the employee.

A robust performance program needs to start with well-defined position descriptions that establish the performance expectations of employees, the core competencies, reporting requirements, and professional demeanor that is expected of each employee. The process should include goal setting, discussion between the employee and supervisor at the outset of the year, and an objective review and evaluation process,

midyear and at the year's end. For all intents and purposes, advancement is based almost entirely on seniority – not on achievement, so there is little incentive for employees to improve skills and to generally invest themselves in their jobs.

HR Policies and Procedures

HESCO has not developed a consolidated and easily accessible set of HR policies and procedures manuals for staff and management. From recruitment to termination, clear cut rules and procedures are required. In place of policies and procedures that serve HESCO needs as a large and growing corporate entity, HESCO has continued to employ legacy WAPDA HR policies that reward longevity and seniority, rather than high performance and dedication to HESCO's mission. Many of the legacy HR policies and procedures date back to the early 1980s, and in some cases have little relevance to high functioning electric distribution utilities. The longest serving HR Department staff is usually the one who knows almost all rules and even how and where to find them. Staff, particularly from outside the HR department are, therefore, greatly disadvantaged, because they are dependent upon the Department even for small things, such as leave regulations, etc. In such a scenario, fair HR operations that are transparent and equitable don't take place. Where policies or procedures do exist, there is an inadequate implementation, leaving the door open to influences, both internal and external.

Employee Handbook

HESCO has not yet developed an Employee Handbook, a concise document providing essential guidance to employees on policies and procedures – the Do's and Don'ts to help guide employees. Ideally, such a handbook should be on the web, in booklet form and in both English and Urdu.

Training and Capacity Building

Like the regional training centers (RTCs) at many DISCOs, the HESCO RTC in Jamshoro requires substantial rehabilitation, both in terms of the building and training materials. Based on discussions with training staff at Jamshoro and visits to the facilities, it is clear that training tools, manuals, and other aids, are not adequate to meet the growing needs of HESCO. For instance, linemen are trained with tools that are not commonly available or provided to the line workers. The line workers are, in general, not provided basic line tools and equipment required to perform corrective maintenance and line operations in a safe and effective manner. Over the past few years, the RTC has had its share of bad luck; it got burned down during the riots following Benazir Bhutto's assassination in 2007, and to make matters worse, the rehabilitated RTC was adversely affected in the floods of autumn 2010. Therefore, the HESCO RTC is in urgent need of rehabilitation and attention.

HESCO does not have a comprehensive training and development action plan and generally lacks training or capacity building programs. The training that is offered is mostly targeted to allow employees to advance within the organization that is, preparing employees for promotions. Training is not really oriented towards substantive skill development. HESCO has not designed or implemented an effective needs assessment plan which is needed in order to design future training programs. The training facilities are ill equipped, with instructors who have not been retrained in many years, and with training manuals that were developed in the 1980s (under a USAID program) and have since not been updated. The training program also lacks a program to perform post training impact evaluation.

While a complete training needs assessment will be needed for HESCO to provide a detailed identification of specific training needs, the PDIP team has identified essential training needs that should be addressed at the earliest possible date. These include, but may not be limited, to the following:

Commercial Training:

1. Meter reader training. This training should focus on familiarizing meter readers with new metering technologies; training meter readers to use handheld electronic meter reading devices; training meter readers to identify and record meter faults, meter tampering, and meter maintenance requirements; and ensuring that meter readers are properly oriented in carefully recording and transcribing data.
2. Improving basic computer skills for commercial staff. This would dovetail with ERP implementation, to ensure that commercial staff understand how to specifically manage new levels of responsibility using ERP screens, troubleshooting functions, modifying customer information, printing modified bills, and other basic tasks associated with an advanced commercial customer information and billing program.
3. Customer service training. This would orient commercial staff to think of and treat customers as valued clients.

Engineering & Operations Training:

1. Safety management program. Establish a safety management program, and provide basic and advanced safety training to DISCO linemen and line superintendents.
2. Work planning management. Train line crews how to work more effectively to complete tasks in a timely manner. Concurrently, train line crew supervisors how to manage crews more effectively.
3. Area planning and mapping. While the long term goal for engineering staff will be to develop and deploy GIS systems, in the interim, HESCO staff could and should develop improved manual mapping and planning tools.
4. Line design. HESCO and other DISCOs don't really design a distribution line. Rather, they use rule of thumb as a proxy for engineering design practices and procedures. This results in high cost, and often inappropriate line design.
5. Metering theory and practice. This would focus on training engineering staff on a variety of metering options, meter types, and metering applications.

Finance & Accounting:

1. Internal audit training. HESCO internal auditors focus on only one of several internal audit obligations as outlined in the internal audit manual – identifying low/inaccurate meter reading. Internal audit obligations are far broader than only focusing on meter reading.
2. Updating accounting manual. Training accounting staff in accounting best practices as specified in the revised accounting manual. Training should be provided in compliance with chart of accounts.

Human Resource Management:

1. Basic computer competency training. MS Office applications, management of the HR data base. Human resource staff needs to improve basic computer skills to manage modern human resource software.
2. Human resource planning and forecasting training. This is a more specialized training aimed at improving overall capacity of the HR department to undertake manpower planning and assessing training needs.
3. Annual performance evaluation program design and training. To familiarize the employees and staff with the performance evaluation program.

4. Capacity building for trainers. This is an important training of trainers program.

2.6 COMMUNICATIONS AND OUTREACH ASSESSMENT

2.6.1 Overview

HESCO is a leading electricity distribution company with a large base of internal and external stakeholders. It serves 1.5 million customers through a vast network of sub-divisions, divisions and circle offices. The assessment establishes that HESCO cannot fully develop into a service-delivery organization without a coordinated corporate and public communications effort. The public must understand the new role of HESCO given the implicit status of its 'assumed autonomy'. As such, effective public communication must be considered a key area if it is to meet the goal outlined in its mission which is to '*excel customer expectations with reliable and stable services and to distribute electricity for the progress and prosperity of the people'* in the service area under HESCO.

As a corporate entity, HESCO stands at a turning point. The organization is in the process of bifurcation into HESCO and SEPCO (Sukkur Electric Power Company). As a result, almost fifty percent of the existing staff of HESCO will be transferred to SEPCO which will cover consumers in Sukkur, Larkana, and Dadu circles, while HESCO will continue providing electricity to Hyderabad I and II and Nawabshah circles.

HESCO continues to face a wide range of problems in the face of the growing electricity demand-supply gap. The organization is, so far, focusing on controlling **electricity theft, reducing energy losses, and improving the state of receivables**. The decision makers at the top level, perhaps, have yet to realize the importance of building a corporate image to win over customers' trust and satisfaction.

2.6.2 Summary of Key Findings

The following are key findings of HESCO's communications and outreach:

- **Internal Protocols & Practices of Communication:** The organizational culture follows outdated practices of internal communication, resisting the process of transition to a modern, service delivery organization.

- **Corporate Communications & Consumer Outreach:** External communications and public outreach has been extremely restricted and not considered a priority at HESCO. The prevailing belief within the HESCO staff – especially among its senior management – is that much of the public in its service territory does not know what the exact role of HESCO is, much less what its responsibilities are. The public frequently confuses the organization with its predecessor, WAPDA.

- **Public Relations Department:** The Public Relations arm at HESCO is relegated to serve an administrative role that operates to issue press information only. With no authority, the section lacks an institutionalized structure and decision-making role and therefore operates in an ad hoc manner. As such, HESCO only undertakes external communication at the local media level and that too, with a very limited scope.

- **Low IT Penetration:** IT penetration at HESCO is very low. Even the management is mostly not computer-literate. Usage of modern communications technology and across-the-board training for such tools was observed as inevitable for a corporate shift to more efficient, prompt and proficient communications.

- **Media Mix and Products:** HESCO's outreach remains limited to press releases, shut down, procurement notices and the occasional energy conservation awareness message. The website is not maintained or upgraded. The potential of the web portal is not being explored or utilized. There is no annual calendar of outreach activities, whether internal or external.

- **Customer-Centric Communications:** HESCO's customer services centers are operated by mostly ad-hoc staff which substitute at these centers and have no training in handling customers

or their complaints. Complaint records are handled manually and there is no digitization for fast, efficient response.

2.6.3 Analysis & Discussion

In an organization like HESCO - wherein over 16,000 employees are working in different job categories ranging from linemen, line-superintendents to managerial staff and executives – with its operations spread over twenty two districts, internal communication is a complex task. The task becomes even more complicated due to the current traditional communication practices typical of a public sector organization.

HESCO has been unable to take concrete actions towards executing affirmative change in its communication culture due to incessant stress pertaining to the issues of governance, electricity theft and shortfall of electricity. Moreover, despite being mandated as an independent distribution company, HESCO continues to endure the overriding influence of PEPCO and MWP, which further puts operational and financial constraints on its ability to exert independent control over executing mass media campaigns.

Against the backdrop of several limitations, the communications and outreach assessment was conducted to review the efficiency and effectiveness of both the internal and external communications of HESCO. The results are discussed as under.

Internal Communication Process, Protocols and Practices

In the age of ICT convergence, it is discouraging to note that the formal communication in HESCO still relies on obsolete modes of letters and memos forwarded through inter-office files, personal delivery, fax and post mail. While the need to ensure an unbiased and evidence-based process of handling official correspondence is understandable, this system is nonetheless bizarre in the era of electronic mail culture, which was seen as the least common reality at HESCO. It was found that the penetration of computer-based communications technology is dismally low.

Despite the fact that HESCO is believed to function as a corporate organization, nevertheless, it still follows the traditional bureaucratic process and procedures for internal communication. Official letters and circulars are the most commonly used tools to communicate. Within the organization, a degree of frustration appears to exist among the staff due to communication protocols which are too slow to respond to their needs, withholding access to information. **The culture does not yield an enabling environment for fast and efficient communication resulting in organizational fatigue. It was also observed that a parallel, grapevine communication culture persists due to lack of inter/intra departmental coordination which further constrains HESCO's ability to introduce a culture of corporate communications within the organization**. Clarity, creativity and decisive communication are the ultimate casualties as a result of such practices.

The diffusion of information technology across the organization is negligible. No systematic actions are taken at the organizational level to promote the use of computers. **In one extreme example, it was found that circulars were still being prepared on old typewriters.** Therefore, use of computers, in most cases, was considered as replacement of typewriter, and its potential for efficient information management is not fully exploited. The stenographers that used to work in the times of WAPDA have not been re-trained in computer skills and therefore serve as assistants to their managers performing manual jobs. It was also observed during the discussions that proficiency of English language was not very good; it was poor in case of subordinate staff. Hence, the quality of communication was very basic and lacked depth and dynamism.

The management does not seem to grasp the fact that ICT skills are essential for ensuring efficiency within the organization. The concept of intranet for internal communication seems to be a novel idea. Similarly, the need for developing a database of employees, organizational policies, rules and regulations for ready access has not been considered a priority. Usage of modern communications technology and across-the-board training for such tools was observed as inevitable for a corporate shift to more efficient, prompt and clear communications.

The Public Relations Department

The Public Relations Officer (PRO) operates along with the departments of admin and HR and reports directly to the CEO. Nevertheless, the Public Relations Officer requires direction from the Chief Engineer, Operations and approval from the CEO to undertake any initiative. The Public Relations Department consists of only three team members (one PR Officer and two LDCs). One lineman is working as the 'official photographer'. The PRO is a professional journalist with experience of working with leading English and Urdu dailies. The relevant experience of the PRO is significant to allow him to develop better relationships with the local media. **The PRO appears to know the local journalist community well and HESCO does not seem to have an adversarial relationship with any of the local newspapers.**

The main functions of the PR department include:

1. To scan over 10 national and regional newspapers on a daily basis and prepare a summary for the CEO about any material published about HESCO and the power sector in general.
2. To respond to the media with clarifications, if desired by the CEO.
3. To prepare and issue press releases about HESCO activities, public notices, procurement notices, shut down announcements, etc.
4. To liaise with local press and electronic media for clarifications and media coverage.
5. To keep a liaison with PEPCO for corporate and external communication activities, media queries, and preparation of new media campaigns.
6. To liaise with the designated advertising agency – MAXIM (Pvt) Limited - for preparation of press and electronic media campaigns and media responses.
7. To manage the compilation and publication of a monthly newsletter. (Until February 2010, the PRO published a monthly magazine i.e., HESCO NEWS; however, the publication was stopped thereafter. The existing CEO has once again directed the PRO to restart it from January 2011.)
8. To liaise with other departments to arrange material for and manage printing of Annual Report.
9. To supervise development and printing of informational material like posters, leaflets, etc.
10. To arrange activities including seminars and press briefings on power-related issues.

The PR Process and Practices

The Public Relations Office at HESCO undertakes the external communication at local media level only. The key media products are press releases, load shedding schedule, shut down notices or procurement (tender) notices. The outreach activities include occasional seminars on energy efficiency & conservation and press talks and collaborative events.

The press material is scanned, compiled and submitted to the CEO on a daily basis. This review is shared with other concerned departments as well for their information and input. The PR department liaises with local media for coverage, clarifications and handles the press at local level.

Though the PR department undertakes a variety of above-mentioned functions, it does not have any separate budget of its own which limits its role to an administrative post office. **In this age of information technology and communications, the PR department does not even have any computer, internet connection, or television set.** The PR department is responsible to prepare the press releases as per the brief (usually verbal) of CEO or any other departmental head. The press releases are normally issued in handwritten format and sent to the media houses through fax.

Review of Existing and Previous Communications and Media Mix:

The local press is the most common media channel used by the PR department, followed by radio. The role of the PR department is restricted only to the local media as PEPCO enjoys the authority to conduct national media campaigns on behalf of all the DISCOs, including HESCO.

Except the issuance of press releases and a small number of advertisements, there is no significant media campaign that has been launched or managed by the PRO. Moreover, the PRO does not have any calendar of media events and activities. The issuance of press releases is undertaken on a need basis. A very limited number of outreach activities were executed, mainly concerned with energy conservation and safety seminars. The press releases were issued to ensure coverage of HESCO's activities, power shut down situation clarifications, safety plans and practices. Other than press coverage, informational products such as posters and leaflets, on issues relating to safety and energy conservation, were disseminated.

External and Corporate Communications and Outreach Strategies

The external communication of utilities, like internal communication, is equally important for developing an effective interface with the stakeholders, particularly consumers and other market players. HESCO, having approximately 1.5 million consumers in more than twenty districts of the province, needs a well planned communications and outreach strategy for external and corporate communications. The role of external and corporate communications becomes significant, particularly in the wake of the deteriorating law and order situation and lack of awareness among consumers about the role of DISCOs.

With the increasing electricity demand-supply gap, it becomes much more critical for HESCO to provide reliable and timely information to the consumer. As a priority, promoting its role to the greater public contributes to building consumer perception and trust in the utility's ability to serve a large territory of electricity consumers. However, it was observed that external communication at HESCO is not a priority. The outreach activities were few and need-based. These included a series of open forums, a local platform for hearing consumer complaints called *'khuli kuchehris'*.

A few leaflets were produced by the PR department on safety and energy conservation. The utility bills issued by HESCO are used to carry energy conservation messages as well as a toll free number (0800-84338) to report the theft of electricity.

The lack of availability of budget and capacity of related personnel was seen as one of the constraints in consumer outreach. Since PEPCO carries out the national media outreach for consumers, it claims the maximum share of the publicity budget of HESCO, limiting its ability to reach out to the consumers, which further erodes its corporate image.

Customer Complaint Centers and the State of Communication with Consumers

HESCO operates more than a 100 customer service centers, at regional, divisional and sub-divisional levels. However, a majority of these centers are not equipped with modern technology and tools, and the substitute staff working there is also not trained in complaint handling. The record of complaints is maintained manually.

A regional customer service center in Qasimabad – Hyderabad city - was visited by the team. The center presented a deserted look without any display of information or outside signage. The center is being run by an assistant manager (female) with the support of four (04) staff members. It was reported that dedicated staff was not allocated at circle, division and sub division levels. Such staff belonged to field operations and was made duty-bound to attend customer services centers for a designated time period.

The manual data maintained at the complaint centers could be digitized for a convenient data base and subsequent data analysis for better customer complaint handling. Usage of information technology and training could help to create an efficient environment.

Along with this telephone number 111-111-179, HESCO also operates a helpline 118. The customer service center has not been allocated a separate budget for its day-to-day operations. As per the official policy, a regional customer service center deals only with the issuance of duplicate billing and correction of bills of Rs. 10,000 maximum.

Current State of IT for External and Internal Communication

It was reported that less than 50 computer terminals are in use, making the penetration of IT extremely low. The electronic email culture does not exist as such within the organization. A few of the officials do

have their personal email addresses. However, they are seldom used as most of them do not have access to the internet and computers.

HESCO has a website, which is static in nature and contains limited information. The website is maintained by the MIS department and the PRO has no role in the development of content and messages for the website. There is no dedicated webmaster tasked with overseeing comprehensive management of the website, so the information posted is not regularly updated. Staff working in the MIS department has the additional responsibility to design and maintain the website.

The role of the MIS department is mostly confined to billing and data entry such as cash statement and recoveries, information which is made accessible only to the directors of the departments and the CEO.

Customer Services and Complaint Handling with a Gender Perspective

Though the customer service center, which was visited during the assessment, is supervised by a female officer, the premises cannot be termed as 'gender-sensitive'. There was no separate counter designated for women, no separate seating arrangement, and no separate toilets were provided.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 GOVERNANCE

The Board of Directors does not function effectively as a corporate board. The CEO is appointed by PEPCO, acting on behalf of MWP, and is not selected and hired by the Board. The role of Company Secretary should be independent. The Board Audit Committee includes the Deputy Chief Auditor and the Manager Finance as members. These positions should be removed from this committee and independent board members with a financial background should be inducted in their place.

The newly reconstituted Board of Directors (BOD) will need both governance and electric utility training. The new board members will require training to prepare them for the challenging task of governing HESCO in the changing utility environment in Pakistan, and to advise board members of their roles and responsibilities vis-à-vis the Ministry of Water and Power, NEPRA, and other stakeholders in the power sector.

The BOD should be formally established through an agreement with the government, as an independent governing body with ultimate decision-making authority and, in general, empowered to (1) set the company's policy, objectives, and overall direction, (2) adopt bylaws, (3) name members of the advisory, executive, finance, and other committees, (4) hire, monitor, evaluate, and fire the CEO and senior executives.

3.2 ENGINEERING

The engineering results section of this report presented an evaluation of HESCO's distribution management system, and the results of a mapping and loss assessment effort. This section will present the conclusions of the engineering analysis team resulting observations and analyses, as well as recommendations for opportunities for improvement.

Transmission Network

The engineering assessment did not include specific analyses of the transmission network, as it was clear that the major problems were in distribution. Adequate planning practices appear to be in place to ensure that the transmission network is appropriately expanded.

Distribution Planning Processes

HESCO's planning department clearly understands the need for integrated distribution planning as a means of arriving at an optimum distribution network design. The two prerequisites for integrated planning are accurate geographical maps and analysis software that is easy to use and can incorporate geographic input. An efficient mapping method would be the use of GPS units to locate facilities in the field followed by transfer of the information to a geographic information system (GIS). This would make the information available for direct transfer to more sophisticated analysis software that can directly accept digital input. HESCO could undertake a GIS mapping effort with little more than some additional training subject to the availability of proper GIS software. Advanced analysis would require the purchase of a new analysis software package, but this cost is small in relation to what has already been expended on the existing system. HESCO could therefore have a fully up-to-date mapping and analysis system at a low cost.

Since this mapping activity is being carried out by Barqab and other local consultants, HESCO should develop staff resources capable of using a new GIS based system. Although they have not received training on ArcGIS or any such other software, they are eager and competent professionals with the ability to adapt to a GIS environment, and to make use of advanced analysis tools.

Standards and Specifications

Updating standards and specifications is handled by NTDC's Design and Standards Section. WAPDA construction standards have generally served HESCO well and there does not appear to be any immediate need to undertake significant alterations in the standards, with two exceptions:

1. Transformer standards require review of the current environment of high cost power. The Section has issued a revised standard calling for a 27% reduction in maximum allowable losses for transformers, but much more can be done to lower transformer losses. In dense systems such as Lahore City, transformer losses account for half of total technical loss, and even the revised standards allow almost twice the losses as can be achieved with more modern technologies. Wound core and amorphous core technologies need to be explored.

2. Open conductor LT is an invitation to theft, as well as a source of consumer outages. HESCO should expand multiplex or ABC types of LT construction, as opposed to the ad-hoc solution of occasional use of covered conductor in a standard open wire configuration.

Procurement Effectiveness

The PDIP team observed that the procurement process followed by HESCO fails to take advantage of the principal opportunity for reducing the costs of materials, and that is the economies of scale. HESCO procures a large amount of goods annually, which should give considerable leverage in obtaining favorable pricing. However the procurement process breaks this relatively large quantity of procurement into over 100 separate solicitations, largely diluting the benefits that could be obtained. HESCO is still using the legacy WAPDA category system which tends to break procurements into a large number of individual solicitations. When WAPDA was a government agency, this was necessary to ensure that all vendors received some portion of the orders, but now that HESCO is corporatized, it is less appropriate. The need to handle such a large number of solicitations also introduces a considerable overhead burden on the utility.

A byproduct of breaking the procurements into small parts is to discourage international suppliers who can often source material from a number of countries and offer better pricing and higher quality. Again, this may have been appropriate when WAPDA was a government agency and it was considered to be policy to encourage local suppliers, but any action that limits the size of the bidding pool increases cost and tends to reduce quality.

While there is no absolute method for determining the ideal size of a solicitation, it is likely that the need for materials could be satisfied by 8-10 procurements a year, two each for poles, hardware and accessories, cable and conductors, and transformers. Special purpose solicitations may be necessary for turnkey items such as substations, but even these should be few and large. It may even be possible for sharing of procurements between DISCOS allowing for increasing the size of procurements to levels that would be really attractive to international vendors.

Another observation is that the Procurement Division does not seem to have the ability to purchase small quantities of materials to make up shortages. Since most vendors are national, there should not be any difficulty in procuring small lots of specific items necessary to fill a project material list, but this is not currently being done. The use of solicitations for all procurements is no doubt a legacy of WAPDA's government history, but a corporation needs more agility than can be provided by an insistence on solicitations as the sole opportunity for material procurement. The use of larger, fewer solicitations to procure the majority of the required material at low cost can be combined with flexibility for purchasing of small quantities on the local market when needed to provide a more efficient procurement system.

Construction Quality

Construction at HESCO is carried out by local prequalified contractors whether it is ELR or rural electrification. The construction quality in general is acceptable with reservations as the Project Director Construction staff is responsible to ensure the quality of construction. Though Barqab as a consultant is responsible for construction inspection, quality assurance is not adequately documented, resulting in construction quality that is not up to electric industry standards. The engineering team determined that the construction department is entirely self-policing, that is, there is no cadre of staff identified as

construction inspectors, nor does the department contract for external inspection services aimed at quality control. As a consequence it is difficult to ensure quality of work.

One practice of the construction that results in frequent outages, as reflected in the frequency of maintenance calls, is the failure to use connectors on jumpers and other joints. It is clear that at one time, HESCO did use connectors, but they are no longer used in new construction. All joints appear to be made with wrapped or "served" aluminum strands. No matter how neatly this is done, it is bad practice and will result in a failure of the joint, especially if it is a high current LT joint. The standard connector specified by the WAPDA construction standards is a two bolt aluminum parallel groove connector, which is admittedly expensive. However, parallel groove compression connectors are cheap and simple to install with hand operated tooling, and provide far superior connections with much lower resistance than wrapped joints.

Operations

The operations subdivisions are responsible for many things, but those upon which they place the most emphasis are commercial operations such as meter installation, meter reading, and disconnection of defaulters, and continuity of service tasks such as repair of faults.

The engineering team found that at the subdivisions, procedures exist for almost all tasks, but subdivision staff was not proactively engaged in compliance with company procedures, particularly with record keeping tasks such as recording transformer loading and rebalancing. This results in poor transformer loading, as was noted in the results section of this report.

The engineering team found that the subdivisions are overstaffed in some cases and under-equipped for their assigned tasks. It was commonly stated that roughly half the linemen are not able to climb, while lack of equipment reduces the ability of ground bound assistant linemen to be of any assistance. Thus even large crews are limited to watching a single lineman on a pole or in a tree and are not productive. Tools, both hand tools and heavier equipment are in poor condition, and are inadequate in quantity. There are no tools such as blocks and tackle for lifting, handlines for transferring items up the pole, or wire handling tools such as grips and come-alongs for tensioning conductors. Tree trimming equipment consists of an ax, while trimming shears and pruning hooks are mainly ornamental and too dull and weak to be of value. Transport is limited and most jobs are handled by the linemen traveling on their own motorbikes.

In addition, safety emphasis is very limited with no recurrent training, no safety meetings, and no safety program for enforcement of safety rules. Protective equipment such as safety belts and grounding sets are of poor design that do not serve the required purpose. The result is a startlingly high fatality rate among linemen and unwillingness on the part of assistant linemen to undertake the tasks of climbing linemen. Linemen fatalities are blamed by management on a refusal to wear protective equipment, but the PDIP team finds this an unconvincing argument at best. Safety programs must have enforcement provisions, but it is the responsibility of management to provide appropriate equipment and recurrent instruction in its use and care.

Meter Security

While meters have improved in quality and accuracy – and moreover, cannot be opened even when seals are removed, challenges nonetheless remain. Innovative power thieves have succeeded in violating even these meters, but there is no question that they are more resistant to tampering than the older electromechanical meters.

However, the primary threat to meter security is not the meter itself, but continues to be the service drop and the connections to the meter, which are completely unsecured, as well as the LT network which is still composed of bare conductors. HESCO has taken no steps toward providing improved security for exposed connections and service conductors and for conversion of vulnerable LT to covered conductors.

Another concern is the existing fleet of electromechanical meters, numbering in the millions that are still in service on the system. These meters were in most cases not highly accurate to begin with and age has not improved their performance. These meters have not been calibrated since installation, and while it is certainly in the utility's long term interest to replace them, in the short term, they can be invested in to the

extent that they can be brought to a reasonable level of accuracy through inspection and calibration, which can improve the commercial loss situation.

Technical Losses and Loss Segregation

The team carried out a mapping and modeling effort on a sample of the feeders, transformers, and LT networks in the HESCO system with the objective of determining the level of technical loss. The sample chosen was representative of the system as a whole and so its losses can be taken as a proxy for the technical loss of the overall system. The technical losses in the distribution system for HESCO were found to be 9%, broken down as follows:

- Conductor Loss 4.9 %
- Transformer Loss 2.2 %
- LT Network Loss 1.8 %
- Service Loss 0.1%

This level of technical loss can be compared to the total distribution network loss of approximately 31.2%, indicating that commercial losses are on the order of 22.2%. This shows that HESCO's major challenge in loss reduction is in the area of commercial loss.

Opportunities in Loss Reduction

The opportunities for loss reduction in HESCO are more on the non-technical side but, at the same time, technical loss reduction also needs concrete measures.

Mapping and Planning Improvements

- *Generation of a detailed load forecast.* Load forecasting, when driven by demographic and economic information, can help identify areas where attention is required.
- *Use of GIS for mapping.* Introduction of proper GIS mapping will speed up the process of generating useful maps and eliminate much of the manual labor involved in the current process. Use of GIS will allow the automated transfer of system information to advanced planning software, speeding the production of integrated plans and allowing the planning staff to identify areas in which interventions are required for loss reduction.
- *Application of advanced planning software.* Advanced planning software that accepts digital input from GIS databases and has a graphical output can speed consideration of alternative system designs and assist in developing integrated distribution plans. Use of such software will allow for consideration of potential problems before they result in high losses or poor service quality.

HT Improvements

HESCO's average feeder length is almost 71km, which means that the system is somewhat rural. HT improvements are of interest mainly on rural feeders, where, due to their longer length, there is more conductor loss. Opportunities are:

- *Application of capacitors.* The installation of capacitors could improve power factor on the sampled feeders by 95%, and reduce losses by 27% on the longer sample feeders.
- *Selective re-conductoring.* The majority of the high conductor loss is to be found in the first 10% of feeder length, where the load is heaviest. Replacement of the commonly used Dog conductor with Osprey would reduce losses by 50% in these segments of line without the need for bifurcation or addition of new breaker positions.
- *Development of improved transformer specifications.* That would dramatically reduce transformer losses. Transformer losses reflect about 24% of HESCO's technical loss, and technologies exist to cut even the current new specification losses substantially.

- *Review of long feeders (over 71km in total length)* on the basis of voltage drop rather than thermal capacity. The current method of identifying problems only when conductor load exceeds 300 amps is inappropriate for long rural lines. These circuits have already entered into voltage problems and high losses long before reaching the 300amp threshold.

- *Application of compression connectors for most taps and other joints* so as to eliminate jumper burnouts. Points at which sectionalizing is done would be retrofitted with bolt-on connectors to facilitate disconnection. Replacement of wrapped joints would reduce callouts for jumper failures and improve service quality, though the impact on losses would be small.

LT Improvements

- *Preparation of a census of consumer locations* so that consumers can be linked to the transformers that serve them in the CIS. This would allow for improved transformer load management as well as providing an opportunity for evaluating losses on a transformer by transformer basis, using portable measuring instruments to correlate transformer loading and sales.

- *Selective replacement of open wire LT line with multiplex or ABC* to reduce vulnerability of the system to casual hooking. A side benefit of this action would be a reduction in the incidence of transformer damage due to short circuits occurring on the open wire LT.

- *Relocation of transformers* so that they feed the center of an LT sector rather than the end. This would reduce losses on the affected LT sector by 50%. The incidence of end-feeding is uncertain.

- *Retrofitting of compression connectors for jumpers and other high current joints, and improvement of the connections to the LV bushings of transformers.* The present system of wrapped joints produces a significant level of callouts for overheated joints, which though not a loss issue, do affect consumer service quality.

Metering Improvements

- *Introduce an electromechanical meter testing program* that is oriented toward ensuring accuracy of electromechanical meters until they can be replaced with electronic units. This would be combined with an accelerated program for changing electromechanical to electronic meters.

- *Evaluate options for improving the security of meter installations* by using connection boxes and neutral concentric cable as opposed to unguarded open installations. The customer cannot be given access to meter bottom connections or the installation has no security at all. Neutral concentric cable encloses the cable in a grounded sheath so that any attempt to penetrate the cable with a sharp item such as a nail or an awl will cause a short circuit and defeat the attempt at penetration.

- *Investigate the use of socket type meters* which provide greater security for meter connections, and which have larger high current connections, allowing them to be applied for direct reading up to 320 amps. This would reduce the number of CT type meters that have to be installed, removing the CT accuracy as an issue.

- *Replace most of the current stock of CTs in use in industrial metering boxes with either direct reading meters or higher quality CTs.* There have been a number of instances of CT failure, which of course compromises the meter reading.

- *Work with meter manufacturers to improve the security of indirect meters (CT and CT/PT installations).* The current crop of electronic indirect meters can be reprogrammed from an optical port to alter the meter multiplier. This creates a vulnerability to any person with the correct software and the optical programming wand, all of which can be obtained at a low cost in various markets.

3.3 FINANCIAL MANAGEMENT

While HESCO collections are reportedly at 42.3% on an overall basis with 72.5% for private consumer energy sales, there remains an on-going problem with government collections. Reported government collections were only 18.2% of energy sales to government clients in FY 2010. Given HESCO's role as a

quasi government agency, it has proven impossible for HESCO to treat government clients on an equal commercial level as other clients. If a government client does not pay, HESCO is slow, and in some cases unwilling to take the measures needed to collect from these clients.

As reported in the results chapter of this report, HESCO has a reasonably effective arrangement with the banking system and other local payment centers to collect funds from its consumers. This arrangement ensures that collections are managed effectively and relatively efficiently. However, there are two issues with the collection system that is being used. First, many collection points – including some banks – retain customer payments to HESCO for much longer than they should. The pay points should transfer funds on a daily basis, but many retain the receipts for as long as a week. Approximately 74% of cash receipts are received on the same day they are paid to pay points at the HESCO principal bank account. Approximately 10% of cash receipts are received through offline banking transactions which involve a 2-3 day delay in getting to HESCO's account. The remaining 16% are receipts from post offices which may take a week. Remittance of these funds from HESCO to the CPPA in payment of purchased power is important, and creates a significant loss from the perspective of the CPPA.

HESCO's desire to implement an ERP solution will provide the means to integrate business, human resources, engineering, asset management, work plan management, and operations into an electronic environment that can be used in real time in all phases of HESCO operations. Enterprise systems offer the opportunity to convert manual business and distribution operating systems to electronic, computerized management systems. This will be important as HESCO transitions into customer information and billing system, geographical information systems (GIS) and applications.

Enterprise systems allow electric utilities to employ financial and management controls that would otherwise be absent. Full implementation for an ERP at HESCO, for example, will allow an internal control audit to identify vulnerabilities in accounting and work flow management, and to address these vulnerabilities through improved controls and management processes.

HESCO needs to expand and enhance internal audit practice and procedures that were established in 1985, and have not been updated since then. The legacy WAPDA audit manual is too narrow in scope to effectively audit HESCO's financial and functional activities, and will not be sufficient to perform auditing procedures as the organization has evolved and new system processes have been introduced.

It is interesting to note that, the internal audit division has only partially complied with the scope defined in the existing audit manual, that states, "Internal Audit Division has to insure that rules and orders framed/adopted by the Authority from time to time in connection with execution of works, pay and allowances, stores, etc. and for maintenance of various accounts, books, etc. are followed by all WAPDA formations/offices and the defects and irregularities noticed in such accounts/ books are rectified as far as possible." At present, the internal audit only functions as a limited review of certain transaction based activities. The internal audit approach focuses only on transactions rather than full reviews of internal control systems.

The HESCO accounting manual has not been revised since 1985; like the audit manual, there is an immediate need to revise the update and improve the accounting manual. Once NEPRA defines the chart of accounts, the manual will need to be normalized to comply with NEPRA requirements.

There were a number of instances of government involvement noted which constrained and hampered the operations of HESCO. These include:

- PEPCO has currently placed a ban on the purchase of new vehicles when almost one third of the vehicle fleet is 20 years of age or older.

- Government of Sindh has decided not to pay for the energy consumed by its departments since the last three years. The receivable amount from Government of Sindh is Rs. 25,790,073,763 million as on June 30, 2010. This huge amount of receivable has seriously questioned HESCO's status as a going concern.

- All DISCO investment projects are required to be filed with the Planning Commission (PC), Central Development Working Party (CDWP) and Executive Committee of National Economic Council (ECNEC) for approval regardless of funding status. It is a very burdensome process.

Finance and Accounting Recommendations

1. HESCO should hire a consultant to revise and update accounting and internal audit manuals in line with the movement to modernize HESCO, to increase the internal auditing scope to more effectively serve the needs of the Board of Directors, and to adjust to the new ERP environment in future.
2. Effective follow up with the Govt. of Sindh for the recovery of old outstanding and staying up to date on future billings.
3. Evaluate means of improving transfers from pay points to HESCO bank accounts.
4. Initiate and complete the implementation of the ERP platform, and expand applications to serve all finance and accounting needs in line with control, management, and financial reporting to the HESCO Board of Directors, NEPRA, and the Ministry of Water and Power as needed. This would include developing an in-house IT support structure which would accommodate the service needs of the organization.
5. Obtain insurance coverage for buildings, equipment, inventories, and such other assets as deemed necessary to eliminate exposure to significant financial loss.
6. HESCO should invest in the purchase of a ten year financial forecast model, and appropriate training, for its business planning purposes.

An observation of the PDIP team is that HESCO suffers from a lack of reliable access to long term capital. Because of its wholly owned government status, banks are reluctant to lend significant amounts unless ordered to do so by the government. The only available source of funding available to HESCO is through International Donor Agencies. Often the proceeds of loans by the World Bank or ADB, such government financing is not reliable or predictable, nor is it's availability dependent on the financial strength of the DISCO itself, thus reducing the requirement for internal fiscal discipline. The shortage of reliable, reasonably priced investment capital has a significant impact throughout the organization, reducing the emphasis on long range planning, in favor of make-do arrangements. Such a dependence on government financing must end if the utility is to be able to reliably carry out its obligations to its consumers and function as a true corporate entity.

3.4 COMMERCIAL MANAGEMENT

Commercial policies are defined in a logical fashion, but are not effectively practiced. Moreover, the policies and procedures have not kept pace with changes in technology; rather than using electronic data collection and transfer, HESCO relies on manual recording, transcription, and data transfer processes. These need to be changed at the earliest possible date by electronic data collection and processing, reducing potential for manual adjustments and interventions that result in loss of commercial integrity.

The meter reading practices currently employed are subject to influence by operations management. Given that the goals of network operations and management are distinct from the goals of the commercial department, there is a need to realign reporting requirements and oversight of the commercial staff.

As mentioned in the opening remarks of this chapter, there is an urgent need to introduce more modern, advanced technology into commercial management of HESCO. Use of automated meter reading (AMR) meters; prepayment metering technology; handheld meter reading technology, and other advanced communication and metering technology would eliminate reading and transcription errors, and reduce vulnerability to meter employee and consumer manipulation of metering data. Use of AMR meters on industrial clients and transformers would make energy accounting more readily available, and would support work planning and analysis of the distribution infrastructure.

Adequacy of Error Detection Practices

The line superintendent, the reading section supervisor and the SDO are required by the *Commercial Procedures* to check a prescribed number of meter readings and bills delivered to ensure that "losses are brought down to a bare minimum and bills are delivered to the consumers." The XEN is also charged to physically check site readings and distribution of bills. SE is not only required to check readings but he is also required to review the meter reading auditing checks by the SDO and XEN. HESCO management and staff readily stated that these practices are not followed as required by HESCO policy.

Without an objective and periodic review of meter reader performance, meter reading personnel can manipulate (and reportedly do manipulate) consumption data for the purpose of increasing revenues or meeting performance targets. Because auditing procedures are not followed, collusion between employees and selected consumers will not be detected.

A program of routine meter inspection by the M&T department would identify meters that no longer function according to standard. Meter readers would no longer be the only distribution employee responsible for detecting faulty meters. The meters should be randomly selected from a population that has been stratified by the risk associated, i.e. meters with high consumption have a greater chance of being selected, to provide an acceptable cost/benefit of the testing program.

Since the billing software has been turned over to DISCO management, transaction audits have been discontinued. Transaction audits are designed to identify changes to the consumer database, such as consumer status and tariff class changes. Changes are audited against authorizing documentation that is required to authorize changes. Without transaction audits, DISCO staff may make changes to the data base without fear of detection. Audits are common in most well-managed electric distribution utilities.

Billing Cycle and Energy Accounting

Streamlining the billing cycle will result in financial benefits to HESCO and/or to CPPA. Improving billing cycle efficiency will result in accelerating collections, allowing HESCO to generate short-term interest dividends, or to allow CPPA to reduce interest and penalty charges that may accrue from delays in payment to generation companies.

HESCO billing, collection and financial transfer procedures are common business practices for a manual system that could be made more effective for recorded transactions if followed. Adding new technology and revising the procedures for the additions would streamline the billing cycle and reduce errors. These changes will accelerate cash flows allowing HESCO and/or CPPA to avoid late payment penalties.

Establishing a method to more accurately account for energy sales by feeder or distribution transformer would yield additional value, and could result in reduction of non-technical losses. Energy accounting, the comparison of units delivered to the units billed for the same time period, could be accomplished by a number of methods. Use of AMR meters as revenue meters, or at delivery points would allow HESCO to accurately monitor consumption via electronic, real-time means. Energy accounting could also be accomplished by using conventional electronic meters on distribution transformers, although this would be subject to the integrity of the meter reading process. The results of energy accounting include the identification of the areas of high losses. If subdivision management were to focus on areas where losses are highest, making a concerted effort to audit meter readings at delivery points, this would support an effective loss reduction program. An effective energy accounting initiative would not only result in lower administrative losses, it would also result in higher billings leading to more income to the DISCO.

Accounts Receivable Recovery

Without the ability to effectively disconnect defaulting consumers, it will be difficult to collect the amounts due HESCO. There is a need to work with the civil authorities to protect employees while performing field procedures and to prosecute those who have unauthorized connections. Without support, the arrearages (and losses) will only continue to grow.

However, HESCO is in business to distribute electricity. It will be necessary to work with the customer to develop payment plans. Many utilities have installment plans for customers that need help in paying past due amounts. The customer signs a promissory note for the amount of the arrearages and the

amount is removed for the accounts receivable. The debt is not forgiven; it just takes a different form. The payments against the note are added monthly to the customer's bill. If the customer bill is not paid when due, the customer is subject to immediate disconnection.

Some of the arrearages are the result of a customer having multiple meters at a single location. The PDIP team was informed of the practice of customers with a high receivable balance, requesting a new connection and letting the old connections continue in default. If the old meter gets disconnected, he will still receive service through the new connection. This occurs because it is the premise and not the customer that is billed. The new connection has a separate reference number. Because of the lack of data available at the subdivision offices, it is not possible to search for a consumer name to determine if the customer is already registered.

It is more effective to develop payment plans while the customer is in good standing. Such plans can include a levelized scheme where an estimated is billed for the first month. Each month, a portion of the cumulative difference between the estimate and actual consumption is added to the original estimate. This difference could be negative or positive. The net effect is the high payments during the periods of high usage are lowered, and the other payments are increased. Such a scheme makes it easier for the customer to budget for his electricity bill since he knows approximately how much it will be.

Improved Consumer Service

Although attempts are being made to improve consumer service, the programs have not yet proven to be very effective. HESCO has established a call center that tracks consumer complaints, forwarding calls to the appropriate party. This program has not been rolled out to all circles, and communication with consumers has been limited. Moreover, complaint resolutions have lagged, given that DISCO consumer service personnel are not always available or perhaps do not make sufficient efforts to clear consumer complaints. Without question, a more aggressive program will be required.

Subdivision personnel assigned consumer service duties are also assigned other duties, attending to complaint resolution part time. Depending upon the nature of the complaint, the consumer service personnel have limited authority to clear complaints, leading to the need for the consumer to make repeated visits to the consumer service center to resolve issues that may arise.

Recommendations

In order to achieve improved commercial performance, a number of interventions will be required that are related to one another. Improvements in metering technology from electro-mechanical meters to electronic meters will have little effect, for example, unless organizational and procedural changes are made in the meter reading auditing process to detect fraud or manipulation of the data. Implementation of a Customer Information System (CIS) will require new accounting, data collection and transfer, and billing procedures. Best practices require that a consumer census be taken to populate the CIS database with accurate information.

1. Meter Reading Audits

While there are a number of interventions listed below, focus should first be on reducing losses and collecting amounts billed. The immediate implementation of reading audits by an independent third party, either the M&T team or outsourced. This may cause a loss of revenue for the first few months as the past overbillings are corrected; however, offsetting this loss will be an increase in revenues for all of the under billings. If meters are honestly read, the customer willingness to pay should increase.

2. Receivable Recovery

Because of the large arrearages, HESCO should develop a policy to allow for deferred payments over an extended period of time. This is not a forgiveness of debt, but an effort to make the repayment of debt more manageable for the customer. The policy should include enforcement clauses in case of continued default. HESCO should also explore the possibilities of using a collection service to recover a portion of the amounts due from dead defaulters.

These interventions are of low costs and are only the beginning of loss reduction and revenue recovery. The can begin immediately without a large investment, but other interventions are necessary to create s significant impact.

3. Energy Accounting

A system of master meters, preferably AMRs but not mandatory should be installed on the LT side of distribution transformers so as to provide data on the delivery of power to a limited area. The master meter and all revenue meters connected to the transformer need to be read on the same day. This will require a reorganization of meter routes.

A comparison of consumption data and the amount of delivery is made to validate the completeness of the revenue meter readings. This exercise will identify areas of high losses which should receive priority in corrective actions. The losses may be due to incorrect readings, meters in need of maintenance/calibration, theft, or required system maintenance.

Following are other recommendations, if implemented in a systematic and coordinated fashion, will further enhance the desired results of increased revenue recovery, improved commercial efficiency, and more effective consumer service:

1. A consumer census to verify/add consumers.
2. Installation of a new Customer Information System.
3. Corporate reorganization so that all commercial activities report to the Director of Consumer Services.
4. Updated metering, using automated metering technology where appropriate.
5. Reorganized and updated meter reading routes.
6. Implementation of energy accounting.
7. Design of more comprehensive customer service and consumer awareness programs.
8. Enforcement of meter reading audits and meter inspection programs.
9. Establishment of a program of systematic meter inspection and repair.

3.5 HUMAN RESOURCES

HR policies and procedures have remained stagnant for the past two to three decades, and currently these do not support HESCO's needs to attract and retain highly skilled, dedicated, and engaged employees. Staff at almost all levels has repeatedly stressed the need for change and intervention in this area.

The Team recommends that substantial investment in HR is essential. It will need to be ensured that HESCO is fully involved in the development of policies and procedures, so that changes are readily accepted.

While there is much work to do to design and define new human resources policies and procedures that are responsive to HESCO's needs, changing the policies and procedures will require a modest investment of time and funds in comparison to other, more capital intensive efforts. These changes, if accepted and implemented, will require a substantial buy-in from HESCO management and staff. Some of the changes will be such as redefining position descriptions, a comprehensive compensation study, and hiring and advancement policies. Others will require a high degree of retraining, communication with management and staff, as well as some fundamental changes in corporate culture.

The principal changes that are necessary have to do with the compensation package, the hiring and promotion program, and the performance management program. As mentioned in the previous chapter, the fundamental changes will need to occur in redefining position descriptions, position requirements, lines of authority, and other, related factors. Concurrently with an upward adjustment in the salary structure, there will likely be a need to sustain staff reductions through outsourcing and attrition.

Significant reductions will be required to bring HESCO in line with best practices, but this issue will require and will receive significant additional analysis before final decisions are made.

Increasing the salary levels to bring them at par with market levels will not by itself change the work ethic and culture. There will be a need to actively engage in a new relationship with HESCO management and board priorities, whereby employees know, appreciate and accept the new corporate culture, where good performance becomes a clear criterion for recognition.

Recommendations

1. Develop performance management program, together with revised position descriptions, setting goals and objectives for all staff positions; and establish mid-year and annual evaluation review process, measuring employee performance, and rewarding employees based upon performance.

1. Modify the recruiting policy to ensure an objective, transparent and unbiased recruitment process.

2. Revise the compensation and benefits system and package, making it attractive and competitive; a detailed market study will be required to devise a new package, and also choose an effective methodology, whereby the new package is introduced in the DISCO. For instance, the new higher package is offered only to those employees, who opt to accept the new terms and conditions of employment, including performance, etc.

3. Develop training and development culture, programs, and upgrade current training facilities (Regional and Circle Training Centers). This will have the effect of making training attractive and more highly valued by the employees.

4. Introduce more advanced information technology for use in human resource management, as well as in training facilities.

5. Review and revise HESCO's benefit plan, including the employee health plan to increase flexibility and choice of health care providers and facilities. Evaluate the introduction of a health care insurance policy.

6. Evaluate staffing levels vis-à-vis international best practices. Develop staffing plan to reduce staffing levels in conjunction with outsourcing and reduction through attrition program. A review of the total work force shows that a large number of employees are in non-core functions, areas, which could easily be out-sourced.

7. Establish a robust lineman safety program that provides structure, incentives, and discipline for all linemen employees. Ensure that linemen are provided and required to use proper clothing and safety gear while performing construction and maintenance tasks. It will be the DISCO's social responsibility that the safety message is extended to the public/customers, through an out-reach program.

8. Evaluate staffing levels vis-à-vis international best practices. It is imperative that staffing levels should be brought down by outsourcing non key staff, and reduction through attrition program.

3.6 COMMUNICATIONS AND OUTREACH

The existing state of communications and outreach in HESCO is the outcome of the survival of rigid public sector practices and traditional tools of communication. An organizational mindset of restricted sharing of information and reluctance to develop information database survives all around.

The PR Department does not play a proactive role in external communications since mass media campaigns are out of its purview and managed by PEPCO. The outreach activities that do take place happen in an ad hoc manner and are few in number. The fact remains that HESCO does not have a formal communications department to act as a custodian of internal, external and public communications. A revolutionary plan is required to change the existing mindset and obsolete tools of communication.

Following recommendations are outlined:

- An integrated HESCO-specific communications strategy should be designed, outlining key objectives, target audience, messaging framework, along with a comprehensive action plan and a supporting budget to sustain effective communications and outreach.

- Public Relations Department should be restructured and strengthened to provide it with an enhanced decision-making role and regular budget which should enable it to plan and execute mass media campaigns at the local level. The job descriptions of the communications staff need to be revised and adequately integrated into the amended organizational chart of HESCO.

- An annual calendar of promotions and outreach activities should be developed setting priorities and providing clear guidelines for the creation and dissemination of information materials. Issues of Corporate Social Responsibility (CSR) and brand equity should be regularly promoted in the local mass media through a series of planned public outreach activities. HESCO's reliance on PEPCO must be reduced to make it an empowered department.

- The decision makers at HESCO should be made to realize the importance and role of ICTs and tools in theft control to reduce losses. Promoting a gradual penetration of internet and communications technology within the organization by linking the staff promotions to mandatory acquisition of basic skills in IT and use of computer, internet and emailing can help cultivate an e-learning culture within the organization.

- Adoption of communications technology should ensure that all managerial staff is provided with related equipment and hardware, desktop or laptop computers and imparted training in basic IT skills, networked within and inter-departments, and mandated to use e-mail as the prime communication tool. This will further help in developing ERP-readiness among the staff at HESCO.

- The development of an intranet should be promoted and encouraged and made accessible electronically to all managerial staff, offering connectivity for online data sharing. Managerial staff must be encouraged to use the database, avoiding the current position of extracting the routine data through a tedious process of inter-departmental communication.

- The website of HESCO should be revamped and made more interactive to act as an information hub for stakeholders and consumers. The website should contain maximum information relating to billing, meter-reading, policies and plans of HESCO. A weekly or fortnightly e-letter should be developed to keep the customers aware of HESCO's activities.

- Outreach activities should include the active engagement of various groups of consumers like industrial, agricultural, commercial and domestic to promote dialogue on CSR and issues of tariff, safety, energy conservation, etc. Seminars, public dialogue, press shows, radio talk shows, and collaborative events are a few examples of activities to be carried out on a regular, planned basis.

- A focused consumer outreach electricity theft control campaign should be launched to inculcate a responsible and accountable consumer behavior.

- Dedicated and trained staff should be deputed at various customer complaint centers to abandon the current practice of depending on field duty staff. All customer complaint centers must be equipped with modern information and communication tools and connected with the central database.

- A speedy and efficient consumers' grievance redress mechanism must be developed and advertised through all available media outlets. The website must have a facility for online complaint registration and a prompt follow-up mechanism. The concept and practice of call centers may be introduced for prompt response to the complaints and queries of the consumers.

- Gender-sensitivity in customer complaint centers must be ensured by providing separate windows, wherever possible, and separate seating arrangement for incoming women to lodge

their complaints. Dedicated female staff should be recruited up to the circle level to offer convenience to women complainants.

- Staff should be imparted training in communications soft skills, including business communication, interpersonal communication, reporting techniques and corporate relations.
- A periodic post-communication monitoring and evaluation practice should be in place for improvement and development of a continuous communications and outreach program.

A. APPENDIX: AUDIT METHODOLOGY

A.1 OVERVIEW OF DATA COLLECTION AND PROCESS ASSESSMENT

The operational PDIP audit process was designed to facilitate data collection and to evaluate engineering, financial, commercial, human resource information and data in collaboration with DISCO management. The objective of this activity was to evaluate performance efficiency by means of performance and process analyses, and by collecting information through one-on-one interviews with DISCO management and employees. The PDIP team not only collected data, but also reviewed and evaluated management practices and processes. For example, a key performance process for all electric distribution utilities involved the commercial cycle – the means by which meters are read, bills are processed and delivered, revenues are collected, and delinquency notices are delivered. For a program whose goal is to measure commercial, financial, administrative, and technical performance, review of key processes like the revenue collection cycle is extremely important.

The operational audit for the DISCO followed an identical process to audits undertaken in the other seven DISCOs. The process collected and evaluated data for four areas of electric distribution operations, including:

1. DISCO governance
2. Organizational review
3. Engineering
4. Financial management
5. Commercial management
6. Human resource management

Comparison of performance indices for a particular utility with those of highly functioning electric distribution utilities highlights the functional areas that require improvement, while comparison of best practices will allow the PDIP team to identify high impact performance interventions.

A.2 GOVERNANCE

In addition to reviewing DISCO operational activities, the PDIP team l reviewed the DISCO governing board policies, procedures, and practices. With increased emphasis being placed on providing a governance structure with a higher degree of operational independence to the DISCOs, it was essential to evaluate the changes that would be needed to better support board composition, qualifications, training, and other characteristics.

Towards this end, the PDIP team reviewed the following documents and board actions:

1. DISCO by-laws that establish board selection processes, scope of authority, and overall board responsibilities
2. Review of board policy and procedures manual, if available
3. Review and analysis of board composition focusing on the issue of ensuring independent governance and adequate local representation on the board
4. Review of board member appointment process, board member terms, and process of removal (if warranted)
5. Board member qualification requirements

6. Training/orientation provisions for new board members
7. Periodicity of board meetings, and provisions for extraordinary board meetings
8. Board member fee structure – are board members reasonably compensated for their participation?

The purpose of this review was to present an analysis of the changes required to improve board composition, functionality, and preparedness to undertake DISCO governance.

A.3 ORGANIZATIONAL ASSESSMENT

The PDIP team reviewed the management and organizational structure of each DISCO with the goal of assessing the efficacy of the institutional capacity to effectively manage its human resources, physical assets, and business systems based upon the organizational structure. The review included an evaluation of the following organizational issues:

1. Analysis of organizational design & structure
2. Review of DISCO departments and divisions
3. Review of key managerial positions and position descriptions
4. Assessment of managerial and functional competencies
5. Review organizational chart, recommend revisions

A.4 ENGINEERING OPERATIONAL AUDIT

The engineering assessment reviewed four components:

- Transmission issues.
- Distribution system management.
- Segregation of technical and commercial losses.
- Distribution standards.

Transmission Review

The transmission review consisted mainly of an evaluation of the contribution of transmission losses to overall system losses. In the event that transmission losses did not constitute a significant component of overall system loss, the evaluation was truncated. In most cases, the transmission networks of the DISCOs are quite robust and are not a source of problems and therefore this segment of the evaluation is very limited.

Distribution System Management

Evaluation of distribution system management consisted of a series of interviews with staff from the Planning and Design, Construction, Operations, and Procurement departments. During these interviews the DISCO staff responded to the team's questions and provided insight into the technical operations of the utility. These interviews were inevitably colored by the attitudes of the interviewees, as well as the misunderstandings of the interviewers, and should be taken as indicative rather than absolute truth.

Typical questions explored by the engineering team included:

- Status and currency of system maps
- Processes used for distribution system planning
- Methods for procurement, adequacy and availability of materials
- Adherence to standards in construction and a visual review of quality of construction

- Meter security and vulnerability to tampering
- Operations practices and adherence to established policies and procedures
- Adequacy of lineman safety programs and equipment

Segregation of System Losses

The third component involved a mapping exercise and power-flow assessment in which the team attempted to use a sampling technique to segregate distribution losses between technical and commercial, and between the various components of technical loss. The team selected 11kV feeders that are, in the aggregate representative of all the DISCO's feeders and therefore indicative of the level of technical loss of the entire company. An even smaller subset of low voltage (LT) networks was surveyed in detail with the objective of identifying the contribution of LT systems to the DISCO corporate technical losses.

In preparation for this portion of the task, the team reviewed transmission and distribution-system performance data to the extent available. Data in the review included:

1. Power delivered to each feeder by month for FY 2010 (July-June).
2. Commercial sales data by feeder, as available for each month of FY 2010.
3. Length of 11 kV feeders and laterals – by substation, as available.
4. Engineering standards, including standard conductor size for all voltage levels, maximum circuit lengths for medium voltage (11 kV) and low voltage (400 volt) distribution circuits.
5. Standard for service entrance, meter installation for each customer category.

The engineering team then selected a group of feeders from the record that, as a whole, represented the principle characteristics of the DISCO; that is, sales distribution between domestic, commercial and industrial consumers, as well as average feeder length.

Each DISCO has up to, and in some cases more than 1000 11kV feeders, so it is necessary to establish sampling criteria as follows:

- Feeders were selected by a random number process so that each feeder had as much chance of being selected as any other to enhance the potential that the set of feeders was truly representative of the system as a whole.
- Average feeder length of sample population was close to the average feeder length of the overall feeder population..
- Distribution of sales in kWh/year between domestic, commercial, industrial, agricultural and other consumers for the population of sample feeders was close to that of the overall DISCO feeder population.
- The sample feeders had complete data, including total sales and feeder input data, total length. Feeders with data anomalies were excluded.
- Total feeder length was limited to 200km, which is the length of line that the PDIP GIS team can survey in the time period allocated.

Once the 11kV feeders were chosen, a total of no more than six LT networks were chosen for detailed analysis. Because data is limited for LT networks, it was necessary only to specify that the LT networks chosen be fed by the selected feeders. To the extent possible they were chosen randomly from the set of general service distribution transformers on the selected feeders.

11kV Feeder Mapping and Analysis

Once selected the 11kV feeders were mapped using a rapid GIS technique that identifies only corner and intersection poles and poles with equipment installed on them. Observable data such as conductor size,

transformer capacity, and transformer status, whether general service or dedicated, was noted manually and transferred to an attribute database.

Once the circuit was mapped, the information was transferred to a Milsoft Windmil model. Milsoft Windmil is a standard distribution analysis software used widely in the US and Latin America. Windmil can model single or three phase loads, 60Hz or 50Hz systems and accepts user information on all conductors and transformer characteristics not in the default database. The majority of the conductors used at 11kV by the DISCO are Osprey and Dog, with some Panther and Rabbit, all of which are ACSR conductors. LT conductors are mainly Wasp and Ant, which are all aluminum conductors. Characteristics for these conductors was obtained from tables and incorporated into the database. Similarly, the DISCOs use a common specification that specifies transformers with maximum allowable levels of losses, a legacy of WAPDA procurement practices. The maximum allowable levels of loss have recently been changed, but none of the new units have been supplied yet. Transformer characteristics used in the model therefore correspond to legacy DISCO transformer values of no-load and load losses, as shown in the table below:

LEGACY DISCO TRANSFORMER VALUES

KVA Rating	10	15	25	50	100	200	400	630
Impedance	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Core Loss (W)	65	85	123	175	310	495	925	1350
Load Loss (W)	320	435	640	1170	2020	3410	5600	8150

It should be noted that these are the values specified in the WAPDA transformer specification DDS-84 for prototype transformers. The standard allows a +15% tolerance in the individual no-load and load loss values of individual production units and a +10% tolerance in total losses. No attempt was made to incorporate these tolerances into the model, but so it is likely that transformer losses are in reality slightly higher than those indicated.

While Milsoft can accept data on location-linked consumer loading, the time available for this project did permit data on actual loading to be used in the model. Instead, the feeder peak load was obtained from substation records and this known load allocated among the various transformers on the basis of transformer capacity, i.e. a transformer of 200kVA was allocated twice as much of the actual feeder demand as a 100kVA transformer.

Another matter that is important is the level of power factor to be used in the model. Substation meters record kWh and kVARH, from which power factor could be calculated, however, only circuit amperes and kWh readings are actually recorded by the substation operators. The engineering team obtained station log sheets from the period around the feeder peak. Estimated average hourly power factor was then computed by calculating kVA using logged amperes and an assumed bus voltage of 11.5kV and the differences between the hourly kWh meter readings to estimate kW.

Once the model, loading, and power factor were established the feeder power flow analysis was carried out. Losses were then developed for conductors and transformers on each feeder. Because of the assumption that the sample feeders represent the system as a whole the percentage losses attributable to conductor and transformers are assumed to apply not only to the sample feeders but to the entire system.

LT Network Mapping and Analysis

Because not all the LT networks on a particular feeder can be mapped, the process of mapping for the LT networks differed from that used for the 11kV feeders. For the LT networks, the mapping included a consumer census of all the consumers fed by the LT network. In addition, a meter reader accompanied the survey team, carrying with him the meter read route book from June 2010, the month of assumed peak demand. It was therefore possible to obtain and record in the GIS database for the LT network the metered consumption for each consumer.

Since the majority of the consumers located on the LT networks are billed by kWh consumption only, it was necessary to convert the kWh data to demand (kW) for modeling. As no measurements of actual demand were available, it was necessary to estimate demand using only the average energy consumption of the consumers. In order to determine the peak demand in kW likely from consumers on each LT network during the month of June, the data on consumption was applied to the demand equation below. This equation was derived many years ago by the Rural Electrification Administration (REA) in the United States, and has been verified by NRECA as acceptably accurate for use in developing countries as well. The equation is as follows:

$$D = N*(1-.4N+(N^2+40)^{0.5})\ 0.005925*C^{0.885}$$

Where:

D= Monthly peak demand in kW for a particular group of consumers

N= Number of consumers in the group

C= Average monthly consumption per consumer in kWh/mo.

The demand value calculated by the equation was applied as the source demand for the particular LT network, at a power factor of 80%, and the demand allocated to the segments of the LT network in proportion to the kWh of the consumers connected to that segment. Losses computed from the model therefore correspond to the losses in the LT network conductors.

It was necessary to generalize these results so that they could be applied to all general use transformers on all the modeled feeders so as to obtain a system value for LT losses. A value of average loss in watts per kVA of transformer capacity was developed for this purpose.

Service Drop Losses

Service drop losses can be calculated on the basis of the assumption that all domestic sales used single phase meters, while all commercial and direct reading industrial sales used three phase meters. In most DISCOs, an effort was made at some point in the past to move meters to the base of the pole as opposed to being mounted on the exterior of the residence. This had the effect of shortening the effective length of the service drop from the utility's standpoint, to something less than 10 meters. Examination of the system indicates that this process has not been completed in many urban areas, and the meters are still located on the exterior of the buildings. For this reason, the average service drop length has been assumed to be 12 meters. The table below indicates the assumptions for the four types of consumer.

TABLE 2.6 CHARACTERISTICS OF SERVICE CONDUCTOR

Consumer Type	Service Wire	Cores	Service Type	Length M
Domestic	7 x 0.052	Two	1 Ph	12
Commercial	7 x 0.052	Four	3 Ph	12
Industrial	19 x 0.052	Four	3 Ph	12
Agricultural	19 x 0.083	Four	3 Ph	12

Average service loading was determined using the REA equation described above to calculate the total demand of the consumers of each class on each of the modeled feeders. Knowing the number of consumers of each type on the feeder allowed for an average demand per consumer to be calculated. Three phase loads were assumed to be balanced.

Calculation of Energy Losses

Once the components of demand loss were calculated, it was necessary to convert the values derived from demand loss on peak to average energy loss. Because losses are a function of the square of load, it was necessary to account for the variation in load during the course of a year. The standard way in which

this is handled is to determine a loss load factor based on the annual load factor of the system. The standard equation used in the US private utility industry is:

$$LLF = K(ALF)^2 + (1-K)(ALF)$$

Where:

LLF= Loss Load Factor, or the load factor of the on-peak losses

ALF= Average annual load factor for the element under consideration.

K = a constant determined by analysis of the load curve of the feeder and recognizing that losses vary inversely as the square of load.

Annual load factor was computed for each feeder on the basis of the data supplied by the DISCO and the loss load factor calculated according to the given equation. The factor "K" was determined by reviewing the substation log sheets for the two-week period around the system peak for the feeder, and determining the K factor by analysis The same feeder loss load factor was applied to all components of loss.

Once the components of energy loss for the sample were determined, consisting of conductor loss, transformer loss, LT network conductor loss, and service drop loss, it was possible to sum all the components to determine the technical losses for the sample and thus for the system as a whole. Any difference between the stated distribution losses of the DISCO and the technical losses calculated by this method constituted an estimate of non-technical loss.

Distribution Standards

The fourth and final component, which was applicable to all DISCOs but was reported only for LESCO, consisted of a series of interviews with staff at the Distribution Standards group of the NTDC. The Distribution Standards group maintains the construction and design standards that are utilized by all DISCOs, as well as the technical specifications that govern all procurements. In addition, the team visited a single manufacturer of distribution transformers and meters in an effort to evaluate local resources for these important components.

A.5 FINANCIAL MANAGEMENT AUDIT

In the preparatory period prior to beginning the operational audits, key financial parameters were identified to be included in the data collection and analysis process. The financial performance parameters that were evaluated include: financial reporting, internal control, cash receipts and disbursements, operational financing and investments and cost containment.

The financial management audit consisted of a combination of interviews, data collection and analysis of key financial data. The interviews with senior DISCO management were conducted to gain an understanding of DISCO policies, procedures, and operating practices. From these discussions, the PDIP audit team identified operational objectives, expected financial and controls, and also identified key areas of risk.

DISCO practices and procedures were evaluated for financial performance parameters. Variance between industry practice and DISCO performance were noted and reported. Procedures were used to test each financial control as a means of verifying the control mechanisms with the results documented in the DISCO assessment report.

The first operational audit undertaken at LESCO served as a vetting process for the above described plan. The financial audit team worked as a single unit at LESCO to ensure that all team members gained the experience and understanding of the assessment process, and to adjust the audit process for later DISCO audit processes.

Once the LESCO audit began, the finance team met with the LESCO CFO to discuss the audit plan and determine with which DISCO officers the PDIP team members should coordinate to perform required tasks. Financial management team members met at the end of each working day to discuss problems, make any necessary adjustments to the process and schedule the plan for the next day.

Tools

The financial management team reviewed LESCO organizational policies and procedures, annual report, system of accounts, interviews with DISCO management and employee personnel. Templates were developed as a data gathering tool to populate various financial models were used for analysis. The financial management team coordinated with the commercial management team to ensure that information and data that was needed by both teams was shared and incorporated into the analysis and reporting process.

Analyses

Analyses included an evaluation of financial management processes, management of banking functions, management of cash and receivables, internal control processes, and overall management of DISCO financial performance. Results of these analyses were presented in the form of data tables, performance ratios, and discussions of specific issues that did not lend themselves to objective numeric presentation.

Presentation of Results

- Analysis of cash receipts and disbursements
- Operational financing
- Internal control
- Cost containment
- Financial reporting with financial performance indicators

A.6 COMMERCIAL MANAGEMENT AUDIT

The focus of the commercial management audit was on the revenue cycle which included the registration of new consumers, meter reading practices, bill production and delivery, and the receipt of consumer payment information. Other activities such as the disconnection and reconnection process, bill adjustment procedures, and customer services were also reviewed. These examinations were made so as to identify opportunities to increase the efficiency and transparency of commercial activities and improve the financial performance of the DISCOs. Opportunities to improve financial performance included revisions to current procedures with technological enhancements or replacement of the billing system with a Customer Information System to better manage customer information with records of all customer interactions in addition to preparing bills. The commercial assessment team consisted of international and Pakistani consultants who have practical work experience with one or more electrical distribution companies, and have some understanding of utility commercial practices and procedures.

Data Collection

Procedural data was collected through interviews and observations. The overall commercial process was ascertained from the Commercial Director. He was given the opportunity to discuss specific problem areas and activities that were deemed crucial to the revenue process. Procedural details for each activity and the time required were obtained from the in-charge department heads. These procedures were verified by observing the actual practices at selected Revenue and District Offices and pay points.

The commercial team also collected billing/collection/consumer data from the billing system. Not only did this data serve as a baseline reference to gauge future results but was also used to provide an indication of the time to complete the revenue cycle. Other hard data collected during the interviews included the number of meter reading routes, the actual number of meters in a route, frequency of meter tests and calibration, customer billing complaints, and number of employees involved in the revenue cycle.

Strategic Analysis

Once the data collection process was complete, the commercial management team members evaluated the data and DISCO commercial practices to determine what changes were needed to improve transparency, cost recovery and effectiveness of the commercial procedures and practices. Each step and

stage of the revenue process was mapped indicating the flow of documentation, when approvals were obtained, decision points for corrective action, and the interaction between departments. These maps were reviewed for redundancies and possible internal control weakness such as a lack of segregation of duties or reconciliations. The maps were studied to determine if there was a more efficient flow of data or where interventions would be helpful in reducing costs, increasing revenues, and/or accelerating cash flows.

The interventions included a combination of investments in secondary distribution systems, transformers, services, and revenue meters; as well as changes in commercial system practices and procedures to improve DISCO metering and revenue recovery practices. The procedural changes required the addition of devices to eliminate transcription errors, to speed the data entry, and to increase internal controls. The Commercial Specialist also evaluated and made recommendations regarding the effectiveness and adequacy of commercial software (the CIS), with the aim of determining if a software solution that more effectively integrates commercial, accounting, human resource, work order, and other DISCO functions would be merited.

A.7 HUMAN RESOURCE MANAGEMENT AUDIT

An integral part of the operational audits included an evaluation of human resource management and HR systems for each DISCO. The HR review evaluated DISCO organizational structure, analyzed performance management systems, evaluated compensation systems, reviewed selected management and staff positions, and performed a preliminary analysis of the training needs, specifically focusing on commercial needs and linemen training to improve the productivity and safety. The HR audit was led by the Organizational Specialist who was responsible for organizing and leading a team of Pakistani human resource and institutional management specialists.

The goal of the human resource management audit was to identify improvements needed in DISCO organizational structure and human resource management to result in an HR model that supports the long-term institutional needs of the DISCO. The HR model should support appropriate levels of compensation and benefits, and establish a work environment that provides the incentives needed to support a well-motivated work force. This model should support emerging process-centric culture, and a cost delivery model that appropriately balances customer service with effective service delivery. The DISCO organizational structure should support high quality electric service and high customer satisfaction, both of which are predicated on highly motivated and satisfied DISCO employees The assessment therefore focused on assessing not only organizational structure and key processes, but also on human resource management and management systems, HR functions and the HR organizational structure in which the HR functions operate, as well as the current roles of line managers and their staff managers.

The HR and Capacity Building team reviewed and evaluated the state of HR management system, functions, responsibilities, performance management systems, and compensation package. The evaluation compared the DISCO human resource management and management systems with best practices from within and beyond Pakistan, from which recommendations were made regarding how the policies, practices and procedures can be improved to enhance the productivity of each DISCO. The HR and Capacity Building assessment team used diagnostic tools to identify gaps in optimal DISCO personnel performance. Data was collected through interviews and surveys to take a baseline of current policies and practices; this was contrasted with best practices to define the actions that are necessary through the DISCO Performance Improvement Action Plans to result in significantly improved human resource policies, practices, and management systems

Data gathering included:

1. Internal interviews and surveys given to department managers and senior engineers
2. Interviews with Chief executives and senior management to evaluate company's Vision, Mission and Strategic Objectives
3. Identification of major functional skills and competencies

4. Surveys of staff from engineering, commercial management, system operations, and DISCO administration at the Division and Sub-division levels to include roles and responsibilities, adherence to existing DISCO procedures, including health and safety, and any other standard operating procedures that exist within the DISCOs.

Review of HR strategic and functional analysis included:

1. Assessment of company's vision, mission, goal and objectives and their linkage with departmental goals and objectives
2. Assessment of recruitment process
3. Evaluation of compensation and benefits
4. Evaluation of performance management system
5. Evaluating the integration of corporate communications and HR communications

Evaluation of training and capacity building needs included:

1. Development of training needs assessment survey form.
2. Completion of training needs survey by distributing needs assessment forms to functional heads to determine critical skills & competencies gaps. The same will be translated into a launch of urgent training program in performance improvement project
3. Identification of essential and immediate training needs for engineering, financial management, commercial management, and human resource functions.

A.8 COMMUNICATIONS AND OUTREACH AUDIT

Communication and outreach is a direct expression of corporate culture and values of an organization. The key areas of communication as well as processes and tools employed to communicate, to a large extent, determine the corporate priorities for internal and external stakeholders. One of the major differentiating features of progressive organizations vis-a-vis status-quo driven organizations is practice of contemporary modes of communication, openness and scientific knowledge management for efficient and speedy decision-making for the larger good of the organization.

A communication and outreach assessment was conducted to have a diagnostic analysis of the state of internal and external communication and outreach. The analysis was intended to provide sufficient information to serve as a foundation for developing communication and outreach strategy leading to action plan, promoting better understanding and improved public opinion of the DISCO as an electricity distribution company.

The Communications Assessment included:

1. Review and analysis of existing internal and external communication and outreach strategy, organization chart of relevant departments and job descriptions of relevant staff.
2. Review of existing and previous communication and outreach campaigns, materials, media mix, budgets, communication briefs etc.
3. Visiting customer centers/ complaint centers to obtain first-hand information on ground communication with customers in terms of customer services and complaint handling style, clarity, processing time and delivery practices. The customer services and complaint handling were also reviewed with a gender perspective.
4. Review of internal communication process, feedback and follow-up status to assess the efficiency of internal communication.
5. Review of current state of information technology being used for external and internal communication.

6. Identifying training needs for the relevant staff
7. Assessing the current practice of using various communication tools/vehicles like web site, newsletters, emails, event management and other multilayered activities.

Drawing from the assessment results, the report describes various issues and identifies areas where action would be worthwhile. It offers a series of recommendations for high priority communication-related activities that could enhance the DISCO's effectiveness in communications and outreach, improve capacity of the communications-related staff and strengthen the effectiveness of its communications department.

Ultimately, the recommendations will contribute towards positioning the DISCO as a service-delivery and customer-centric corporate entity.

Internal Communication

Internal Communication is related to the communication within the DISCO. It could be between individuals, between different departments or between individual and department. The assessment helped map internal communication process, feedback and follow-up status to assess suitability and efficiency of the existing system and procedures.

External Communication and Outreach

The analysis of external communication determines the extent of activities carried out for corporate image building to serve as entry points for keeping a liaison between the organization and its relevant stakeholders, including extended audiences. Promotion of a strong corporate culture and coherent brand identity through appropriate choice of communications tools, processes, media mix, supporting budget and follow-ups are areas that deserve careful attention.

Outreach activities for target groups of stakeholders are an extension of corporate communication to ensure sustained visibility and perception of a positive corporate image.

The following methodology was employed to review and analyze the communication and outreach process and existing strategies of the DISCO:

Key Staff Members Interviews

In-depth interviews with the key informants in the DISCO were conducted using a semi-structured questionnaire. The questions asked were geared towards developing an understanding of existing practices, modes and means, efficiency and speed of communication, availability and access to information. Issues relating to existing penetration of Information and Communication Technology (ICT) and current practices of knowledge management were also discussed. Deliberations also focused on strategic efforts to develop corporate brand image with external stakeholders to spell out a coherent communication strategy for the company. The existing activities of outreach and potential of such activities was also discussed.

Besides key informant interviews, questionnaires were also filled in by relevant senior officers of the DISCO on corporate, external and internal communication and outreach activities of company.

Focus group discussion

A focus group discussion was held with managerial staff of relevant departments to discuss the cross-cutting issues of internal and external communication on similar lines as mentioned above to ascertain the feedback and comments from middle management level. Topics of discussions also included internal and external communication practices and readiness of staff to embrace contemporary communication culture.

Documentary review

Review and appraisal of relevant record and material available with Public Relations Department, MIS and Customer Services Department was undertaken, which included record of daily press cuttings, press releases, printing and publications of Public Relations Department. Similarly, practices and process of data collection, bills printing and various output reports were reviewed at MIS department. The registers

maintained to record details of complaints of Customer Services were reviewed to understand the practices and efficiency of current system.

Visit to the customer center:

The Customer Services Centre located at the DISCO head office was visited to understand the complaint handling process as well as gauge the level and quality of customer service.

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